WAIAU SUBDIVISION - UNIT 2-A
PRELIMINARY SOIL REPORT

WAIAU, EWA, OAHU, HAWAII
TAX MAP KEY: 9-8-02: 3

To:
COMMUNITY PLANNING, INCORPORATED

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

August 7, 1971

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

WALTER LUM
EDWARD WATANABE
EZRA KOIKE

3030 WAIALAE AVE., HONOLULU, HAWAII 96816 • TEL. 737-7931

August 7, 1971

MR. GEORGE HOUGHTAILING
Community Planning, Inc.
Suite 608, 700 Bishop Street
Honolulu, Hawaii 96813

Dear Mr. Houghtailing:

Subject: Waiau Subdivision - Unit 2-A
Preliminary Soil Report
(for residential development)
Waiau, Ewa, Oahu, Hawaii
Tax Map Key: 9-8-02: 3

In accordance with your request, soil explorations were made to determine general soil conditions at the proposed residential development site for Waiau Subdivision - Unit 2-A.

The surface soils at the site may be generally described as stiff to very stiff reddish-brown clayey silts and silty clays with some rocks or boulders. Occasional clay pockets are anticipated.

The proposed light residential houses may be supported either directly on stiff existing ground or on compacted fills constructed from on-site soils. Localized clay pockets near the surface should be removed and replaced with select soils before house construction.

Some grading and filling of the site are contemplated. The earthwork should be done in accordance with the requirements of Chapter 23, Revised Ordinances of Honolulu, 1961 As Amended and the recommendations contained herein.

The report includes a Boring Location Plan, boring logs, laboratory test results, recommendations and limitations.

Respectfully submitted,

WALTER LUM ASSOCIATES, INC.

Ezra Koike

Ezra Koike
Professional Engineer
Hawaii No. 1450

EK:rmf

C O N T E N T S

WAIAU SUBDIVISION - UNIT 2-A
PRELIMINARY SOIL REPORT

WAIAU, EWA, OAHU, HAWAII
TAX MAP KEY: 9-8-02: 3

SCOPE OF EXPLORATION

The purpose of this exploration was to determine general soil conditions for residential development for the proposed Waiau Subdivision - Unit 2-A.

This report includes field explorations, laboratory tests and general recommendations for site grading and residential foundation design.

FIELD EXPLORATION

Seventeen exploratory borings were made at the site. The locations of these borings are shown on the Boring Location Plan. Descriptions of the underlying soils encountered are shown on Boring Logs Nos. 1 thru 17. Also attached are the logs of five borings made for Waiau Subdivision - Unit 1 soil report.

Borings were made with 4-in. diameter augers using a carbide drag bit. Soil samples were recovered with 2-in. thin-wall tube and standard split spoon samplers.

LABORATORY TESTS

Laboratory tests included: natural water content and density, unconfined compression, Atterberg limit, specific gravity, AASHO T-180-57 density, expansion and CBR.

A list of the standard field and laboratory test methods used for this project is given in the Appendix.

A summary of the laboratory test results is given in Tables IA thru IE.

SOIL CLASSIFICATION SYSTEM

Soil samples were visually observed and subjected to appropriate tests in the laboratory. Based on visual observations and laboratory tests, the soil descriptions given on the boring logs are generally made in accordance with the "Unified Soil Classification System."

GENERAL SITE CONDITIONS

The proposed site is located in Waiau and north of Waiau Subdivision - Unit 1-D now under construction.

The site was a former cane field. Concrete irrigation ditches, flumes and cane roads were noted on the site during the field explorations. An earth fill reservoir is located just outside the northeast boundary.

The existing ground generally slopes down from north to south at about a 5 to 10% grade with variations in localized areas. At the northwest and east boundaries, the ground slopes down with grades varying about 20 to 40% or more.

INTERPRETATION OF SOIL CONDITIONS

From the field exploration and laboratory test results, the soils may be generally described as follows:

Stiff to very stiff reddish-brown clayey silt and silty clay with occasional boulders to about 20 ft, the depths drilled. Some localized clay pockets were also noted.

Water was not noted in the borings during the field explorations.

For more detailed descriptions of soils encountered in the borings, refer to the boring logs.

DISCUSSION AND RECOMMENDATIONS

At present, the plan is to clear and grade the site for residential development. The proposed grading is to use cut and fill slopes of generally less than 10 to 15 ft in height.

In general, the soils are clayey silts and silty clays with rocks or boulders. Occasional clay pockets that are expansive are anticipated.

The on-site soils, in general, have sufficient strength to support the fills and proposed light residential structures, provided the site is cleared and grubbed, drained and localized soft spots are removed.

Site Grading

Surface vegetation and miscellaneous debris should be cleared and removed prior to site filling. Localized soft pockets encountered during the site preparation should be excavated

and backfilled with compacted select material. Provisions to drain the site should be included during and after the completion of filling operations.

The ground at the northwest and northeast corners of the site slopes down with grades at about 20 to 40% or more. About 10 to 15-ft fills are proposed over the existing slopes to construct level lots. If practicable, construction of fills over sloping ground steeper than 25% (4 horizontal to 1 vertical) should be avoided or constructed with extreme care.

In general, lots should be graded to drain away from slopes to minimize erosion. If the lots are drained towards the slopes, positive lined drainage swales should be provided to minimize erosion and slumping of the slopes.

In general, the on-site soils may be used for the construction of the proposed fills. Grading work should be done as required by the F.H.A. Data Sheet 79-G; Revised Ordinances of Honolulu, 1961 As Amended; and as recommended below:

1. The area should be cleared and grubbed.

2. Topsoil and stockpiled soils should be either (a) stripped to stiff natural ground or (b) scarified and recompacted before the placement of fills.

3. Hard surfaces along existing haul roads should be scarified down to stiff soils and recompacted to match the density of the surrounding soil.

4. Thin sidehill fills (sliver fills) on sloping areas should be avoided.

5. The construction of fills over existing ground with natural slopes that are greater than 25% should be avoided or made with extreme care. In such cases, after clearing and grubbing, drainage blankets and subdrains should be installed before fill construction. Construction of the lower portion of the slope with granular material should be considered.

6. Along drainage and irrigation ditches where fills are proposed, the bottom and sides should be stripped down to stiff natural ground or scarified and recompacted before the placement of fills.

7. If abandoned irrigation conduits or old wells are encountered on the site, they should be located on the construction plans. Conduits within 4 ft or within 2 times the diameter of

a conduit from finish grade should be removed and the excavations backfilled with compacted fill.

8. Fills should be constructed in approximately level layers starting at the lower end and working upward. Where fills are made on sloping areas steeper than about 5 horizontal to 1 vertical, the ground at the toe of the fill should be benched to a generally level condition. As the fill is brought up, it should continually be keyed into the stiff natural ground by cutting steps into the slopes and compacting the fill into these steps.

9. If boulders are proposed to be used in the construction of fills, they should generally be placed along the toe sections of fill slopes and outside of probable building sites.

   Before placing any boulders, the subgrade should be stripped to stiff natural ground and shaped to drain. A layer of granular filter material should be placed on the subgrade and the boulders placed on the filter layer. The void spaces between boulders should be filled with granular material. A blanket of filter

material should be placed against the boulders before any earth fills are placed against the boulders. See attached sketch, Figure 2.

10. Fills should be laid in 6-in. compacted layers to 90% of the maximum density determined by the AASHO T-180-57 test method.

11. Where clay pockets are encountered near the surface, they should be removed to a depth of about 2 ft and replaced with less expansive on-site soils whenever a building structure or pavement is contemplated.

Slopes

In general, cut and fill slopes of 2 horizontal to 1 vertical or flatter are recommended. Some slope adjustments and patching may be required where clay pockets are encountered.

If slope heights (top to toe) of greater than 15 ft are considered, 8-ft-wide benches should be placed at height intervals of about 15 to 25-ft intervals.

To minimize erosion, the runoff from rainstorms should be diverted by berms or ditches away from slopes whenever practicable.

The surface of fill slopes should be compacted by cat-tracking or with a sheepsfoot roller.

Slope planting is recommended on cut and fill slopes to minimize erosion.

Slope adjustments or other precautions may be necessary if seepage zones or soft spots are encountered in localized areas.

Foundations

If earthwork is carried out as specified, the stiff natural ground and compacted fills should develop adequate bearing values to support the proposed light residential structures.

For light one and 2-story houses, differential settlements will probably be negligible and within the settlement tolerances of residential structures.

General recommendations for foundation construction are as follows:

1. For the proposed light one-story residential structures, conventional house foundations such as slab-on-ground construction or post-and-beam construction may be used.

2. Bearing values for a given soil usually vary with the size and depth of footings. For light, one and 2-story structures, bearing values of about 2000 p.s.f. may be used.

3. Soft spots or pockets of loose material encountered in footing excavations or below the building area should be excavated and backfilled with well-graded granular material such as S4C or other approved material.

4. Concrete slabs on ground should be placed over a base course of 4 in. of well-graded gravel less than 3/4-in. and greater than 1/4-in. in size. The subgrade should be compacted and shaped to a level surface or to drain, if practicable, and generally should be kept slightly higher than the finish grade outside the building.

5. Because of the downhill creep effect of soils on a slope, some settlements may occur near the tops of slopes. Buildings should generally be placed about 15 ft from the tops of slopes. This distance may be reduced for lower slope heights, e.g., 10 ft for 10-ft-high slopes, but generally not closer than 5 ft from the top of any slope.

6. Construction of retaining walls on slopes should generally be avoided.

7. Good surface drainage away from the foundation of structures should be maintained and the site should be graded at all times to prevent the ponding of water.

Roadway

In general, a rough estimate of the roadway pavement thickness for the light residential traffic anticipated is as follows:

1. Wearing course - 2-in. asphaltic concrete.
2. Base course - 6-in. base course.
3. Subbase - 6-in. subbase course over a prepared subgrade.

Provisions should be made in the contract documents to allow for local adjustments regarding subbase requirements in the field in accordance with the design standards of the City and County of Honolulu. In fill areas, the use of select soils within the top 2 to 3 ft of the subgrade may reduce the thickness or eliminate the need for the subbase course.

The subgrade should be compacted and shaped to drain. To avoid the ponding of water and softening of the subgrade at low points, weep holes should be placed at subgrade levels thru the walls of the catch basins which are placed in these low areas.

Utilities

Utilities should be placed after the fills are constructed. Utility lines should be designed with flexible joints, particularly where lines are connected to structures.

Unforeseen Conditions

Unforeseen or undetected conditions such as soft spots and abandoned utilities may occur in localized areas and will have to be adjusted and corrected in the field as they are detected.

PROPOSED SPECIFICATION FOR EARTHWORK

WAIAU SUBDIVISION - UNIT 2-A

General Description

This item shall consist of clearing and grubbing, preparing of land to be filled, excavating and filling of the land, spreading, compacting and testing of the fill, and subsidiary work necessary for grading the site.

Clearing, Grubbing and Preparing Areas to be Filled

Vegetation, rubbish and miscellaneous material shall be removed and disposed of, leaving the disturbed area with a neat, debris-free appearance.

Vegetable matter shall be removed from the surface upon which fill is to be placed. Topsoil and stockpiled soils shall be (1) stripped to stiff natural ground or (2) scarified and recompacted before the placement of fills. Loose surface soils encountered at finish grade shall be scarified and recompacted.

Hard surfaces along existing haul roads shall be scarified down to stiff soils and recompacted to match the density of the surrounding soil.

Materials

Fill material shall consist of selected on-site soils or approved borrow soils. The soils shall contain no more than a trace of organic and deleterious matter.

Borrow soils shall be select soils generally less than 3-in. maximum size, with more than 30% fines and a plasticity index generally less than 20.

Fill material placed in the top 2 ft of fills shall contain less than 30% gravel.

Placing, Spreading and Compacting Fill Material

The selected fill material shall be placed in level layers which, when compacted, shall not exceed 6 inches. Each layer shall be spread evenly and thoroughly blade-mixed during the spreading to insure uniformity of material and water content within each layer.

Rocks or cobbles shall not be allowed to nest and voids between rocks shall be carefully filled and compacted with small stones or earth.

When the water content of the fill material is well below the optimum for compacting purposes, water shall be added until the water content assures a thorough bonding during the compacting process.

When the water content of the material is well above the optimum for compacting purposes, the fill material shall be aerated by blading or by other satisfactory methods until the water content is near the optimum.

After each layer has been placed, mixed and spread evenly, it shall be compacted to 90% of maximum density in accordance with AASHO Test No. T-180-57 or other comparable density tests. Compaction shall be with sheepsfoot rollers, multiple-wheel pneumatic-tired rollers or other acceptable rollers which shall be able to compact the fill to the specified density. Rolling shall be accomplished while the fill material is at the specified water content. The rolling of each layer shall be continuous over its entire area and the roller shall make sufficient passes to obtain the desired density.

Field density tests shall be made to get an indication of the compaction of the fill. Where sheepsfoot rollers are used, the soil may be disturbed to a depth of several inches. Density readings shall be taken as often as necessary in the compacted material below the disturbed surface. When these readings indicate that the density of any layer of fill or portion thereof is below the required 90% density, that layer or portion shall be reworked until the required density has been obtained.

The fill operation shall be continued in 6-in. compacted layers, as specified above, until the fill has been brought to the finished slopes and grades as shown on the accepted plans.

Excavation

Suitable material from excavation shall be used in the fill and unsuitable material from excavation shall be disposed of.

Unforeseen Conditions

If unforeseen or undetected critical soil conditions such as soft spots or seepage water are encountered during the field operations, corrective measures shall be made in the field as they are detected.

Rainy Weather

Fill material shall not be placed, spread or rolled during unfavorable weather conditions. When the work is interrupted by heavy rain, fill operations shall not be resumed until field tests indicate that the water content and density are as previously specified.

BORING LOGS

Symbols

Symbols used generally are in accordance with the Unified Soil Classification System.

Where a parenthesis "(MH)" is used, the soil sample was classified by visual observation of the sample recovered.

Where no parenthesis "MH" is used, the soil sample was classified from either the Atterberg limits or sieve analysis test results.

WAIAU 2A

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: WAIAU SUBDIVISION - UNIT 2-A
LOCATION: Waiau, Ewa, Oahu, Hawaii
Tax Map Key: 9-8-02: 3

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2"SS. 2" O.D. THIN WALL TUBE
2"SS. 2" STANDARD SPLIT SPOON

BORING NO. 1 Sheet No. ____ of ____
Driller: W. LUM ASSOC., INC. Date: JULY 14, 1971
Field Party: MAESHIRO, TSUKAZAKI
Type of Boring: AUGER (ACKER ACE) Diam.: 4"
Elev.: 260'± * Datum: —
Drill Bit: T.C. DRAG

Water Level					
Time	—				
Date	7-13-71				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE BLOWS/0.5'
	ELEV. = 260'± *	0									
(MH)	STIFF, REDDISH BROWN SILTY CLAY W/ROOTS & DECOMPOSED ROCK		2"S	1-A	115	26	91	13,000+	-		8/.5' 9/.5'
(MH)	STIFF, BROWN CLAYEY SILT W/TRACES OF DECOMPOSED ROCK	5	2"SS	1-B	-	38	-	-	-		
(MH-CH)	STIFF, BROWN W/RED & GRAY SILTY CLAY	10	2"S	1-C	118	35	87	13,000+	-		7/.5' 12/.5'
(MH)	MOTTLED GRAY DECOMPOSED ROCK (CRUSHES TO SILTY CLAY)	15	2"SS	1-D	-	36	-	-	-		20/.5'
	END OF BORING @ 21'	20	2"SS	1-E	-	30	-	-	-		26/.5'

* ELEVATION ESTIMATED FROM TOPO MAP DATED FEB. 22, 1971

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: WAIAU SUBDIVISION - UNIT 2-A
LOCATION: Waiau, Ewa, Oahu, Hawaii
Tax Map Key: 9-8-02: 3

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2"SS-2" STANDARD SPLIT SPOON
2"S-2"O.D. THIN WALL TUBE

BORING NO. 2 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date JULY 15, 1971
Field Party MAESHIRO, TSUKAZAKI
Type of Boring AUGER (ACKER ACE) Diam. 4"
Elev. 260'± * Datum —
Drill Bit T.C. DRAG

Water Level	NOT NOTICED				
Time	—				
Date	7-15-71				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2"O.D. THIN WALL TUBE BLOWS/0.5'
	ELEV. = 260'±7 *	0									
(MH)	STIFF, REDDISH BROWN SILTY CLAY W/ROOTS		2"S	2-A	120	23	97	-	-		6/5' 7/5'
		5	2"SS	2-B	-	35	-	-	-		
(MH)	STIFF, MOTTLED BROWN SILTY CLAY W/ TRACES OF DECOMPOSED ROCK										
		10	2"S	2-C	-	34 37	-	-	-		9/5' 12/5'
(MH)	MOTTLED GRAY, DECOMPOSED ROCK (CRUSHES TO SILTY CLAY)										
		15	2"SS	2-D	-	35	-	-	-		16/5'
(MH)	MOTTLED GRAY, DECOMPOSED ROCK & STIFF, BROWN, SILTY CLAY										
		20	2"SS	2-E	-	38	-	-	-		21/5'
	END OF BORING @ 21'										

* ELEVATION ESTIMATED FROM TOPO MAP DATED FEB. 22, 1971

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: WAIAU SUBDIVISION - UNIT 2-A
LOCATION: Waiau, Ewa, Oahu, Hawaii
Tax Map Key: 9-8-02: 3

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2" SS - 2" O.D. THIN WALL TUBE
2" SS - 2" STANDARD SPLIT SPOON

BORING NO. 3 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date JULY 14, 1971
Field Party MAESHIRO, TSUKAZAKI
Type of Boring AUGER (ACKER ACE) Diam. 4"
Elev. 207'± * Datum —
Drill Bit T.C. DRAG

Water Level	NOT NOTICED				
Time	—				
Date	7-14-71				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE BLOWS/0.5'
	ELEV.= 207'± *	0									
(MH-CH)	STIFF, REDDISH BROWN SILTY CLAY W/ ROOTS		2"S	3-A	118	23	96	-	-		7/5' 7/5'
(MH-ML)	STIFF, LIGHT BROWN CLAYEY SILT W/ SAND	5	2"SS	3-B	-	20	-	-	-		18/5'
		10	2"S	3-C	111	44	77	8220	-		7/5' 14/5'
(MH)	STIFF, REDDISH BROWN-GRAY, SILTY CLAY W/ TRACES OF DECOMPOSED ROCK	15	2"SS	3-D	-	43	-	-	-		17/5'
		20	2"SS	3-E	-	41	-	-	-		14/5'
	END OF BORING @ 21'										

* ELEVATION ESTIMATED FROM TOPO MAP DATED FEB. 22, 1971

W&IAU - 2A

WAIAU-2A

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: WAIAU SUBDIVISION - UNIT 2-A
LOCATION: Waiau, Ewa, Oahu, Hawaii
Tax Map Key: 9-8-02: 3

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2"SS - 2" O.D. THIN WALL TUBE
2"SS - 2" STANDARD SPLIT SPOON

BORING NO. 4 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date JULY 14, 1971
Field Party MAESHIRO, TSUKAZAKI
Type of Boring AUGER (ACKER ACE) Diam. 4"
Elev. 270'± * Datum —
Drill Bit T.C. DRAG

Water Level	NOT NOTICED				
Time	-				
Date	7-14-71				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE BLOWS/0.5'
	ELEV.: 270'± *	0									
(MH)	STIFF, REDDISH BROWN SILTY CLAY		2"S	4-A	118	34	89	-	-		7/5' 13/5'
(MH)	STIFF, REDDISH BROWN CLAYEY SILT & GRAY DECOMPOSED ROCK	5	2"SS	4-B	-	52	-	-	-		
		10	2"S	4-C	-	33	-	-	-		8/5' 16/3'
	DECOMPOSED ROCK										
	ROCK										
	GRAY DECOMPOSED ROCK	15	2"SS	4-D	-	16	-	-	-		50/2'
	END OF BORING @ 15.2'										

*ELEVATION ESTIMATED FROM TOPO MAP DATED FEB. 22, 1971

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: WAIAU SUBDIVISION - UNIT 2-A
LOCATION: Waiau, Ewa, Oahu, Hawaii
Tax Map Key: 9-8-02: 3

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2" SS-2" STANDARD SPLIT SPOON
2" S-2" O.D. THIN WALL TUBE

BORING NO. 5 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date JULY 15, 1971
Field Party MAESHIRO, TSUKAZAKI
Type of Boring AUGER (ACKER ACE) Diam. 4"
Elev. 330'± * Datum —
Drill Bit T.C. DRAG
Water Level NOT NOTICED
Time —
Date 7-15-71

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE BLOWS/0.5'
	ELEV. = 330'± *	0	2"S	S-A	117	26	93	13,000+	-		7/5 7/5'
(MH)	STIFF, REDDISH BROWN CLAYEY SILT W/ GRAY DECOMPOSED ROCK & ROOTS	5	2"SS	S-B	-	32	-	-	-		
		10	2"S	S-C	108	42	76	5980	-		4/5' 6/5'
		15	2"SS	S-D	-	46	-	-	-		
	BOULDER ?	20	2"SS	S-E	NO RECOVERY						50/1'
	END OF BORING @ 19.1'										

* ELEVATION ESTIMATED FROM TOPO. MAP DATED FEB. 22, 1971

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: WAIAU SUBDIVISION - UNIT 2-A
LOCATION: Waiau, Ewa, Oahu, Hawaii
Tax Map Key: 9-8-02: 3

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2"S. 2" O.D. THIN WALL TUBE
2"SS. 2" STANDARD SPLIT SPOON

BORING NO. 6 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date JULY 16, 1971
Field Party MAESHIRO, TSUKAZAKI
Type of Boring AUGER (ACKER ACE) Diam. 4"
Elev. 206'± * Datum —
Drill Bit T.C. DRAG

Water Level	NOT NOTICED				
Time	-				
Date	7-16-71				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE BLOWS/0.5'
	ELEV = 206'± *	0	2"S	G-A	96	24	77	-	-		4/.5' 5/.5'
(MH)	STIFF, REDDISH BROWN SILTY CLAY W/ TRACES OF ROOTS	5	2"SS	G-B	-	33	-	-	-		21/.5'
(MH)	STIFF, TAN CLAYEY SILT W/TRACES OF DECOMPOSED ROCK	10	2"S	G-C	117	35	87	13,000+	-		5/.5 10/.5'
(MH)	STIFF, BROWN SILTY CLAY W/TRACES OF DECOMPOSED ROCK	15	2"SS	G-D	-	37	-	-	-		
	END OF BORING @ 21'	20	2"SS	G-E	-	38	-	-	-		18/.5'

* ELEVATION ESTIMATED FROM TOPO MAP DATED FEB. 22, 1971

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: WAIAU SUBDIVISION - UNIT 2-A
LOCATION: Waiau, Ewa, Oahu, Hawaii
Tax Map Key: 9-8-02: 3

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2" SS. 2" STANDARD SPLIT SPOON
2" S. 2" O.D. THIN WALL TUBE

BORING NO. 7 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date JULY 7, 1971
Field Party MEYER, MAESHIRO, TSUKAZAKI
Type of Boring AUGER (ACKER ACE) Diam. 4"
Elev. 313'± * Datum —
Drill Bit T.C. DRAG
Water Level NOT NOTICED
Time —
Date 7-7-71

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE BLOWS/0.5'
	ELEV. = 313'± *	0									
(MH)	STIFF, REDDISH BROWN, SILTY CLAY W/ ROOTS		2"S	7-A	-	25	-	-	-		10/.5' 23/.5'
ML-MH	STIFF, REDDISH BROWN CLAYEY SILT W/TRACES OF DECOMPOSED ROCK	5	2"SS	7-B	-	27	-	-	-		
						LL 50					
						PL 32					
		10	2"S	7-C	-	35	-	7,590	-		13/.5' 17/.5'
(MH)	STIFF, TAN SILTY CLAY										
		15	2"SS	7-D	-	44	-	-	-		
	MOTTLED BROWN DECOMPOSED ROCK	20	2"S	7-E	111	38	80	-	-		8/.5' 8/.5'
	END OF BORING @ 21'										

*ELEVATION ESTIMATED FROM TOPO MAP DATED FEB. 22, 1971

WAIAU 2-A

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: WAIAU SUBDIVISION - UNIT 2-A
LOCATION: Waiau, Ewa, Oahu, Hawaii
Tax Map Key: 9-8-02: 3

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2"SS - 2" STANDARD SPLIT SPOON
2"S - 2" O.D. THIN WALL TUBE

BORING NO. 8 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date JULY 7, 1971
Field Party MEYER, MAESHIRO, TSUKAZAKI
Type of Boring AUGER (ACKER ACE) Diam. 4"
Elev. 328'± * Datum —
Drill Bit T.C. DRAG
Water Level NOT NOTICED
Time —
Date 7-7-71

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE BLOWS/0.5'
	ELEV.= 328'± *	0									
CH-MH	STIFF, REDDISH BROWN SILTY CLAY W/ ROOTS		2"SS	B-A	-	24 LL=62 PL=30	-	-	-		
MH	STIFF, REDDISH BROWN CLAYEY SILT	5	2"S	B-B	112	32 LL=53 PL=35	85	12,580	-		7/.5' 12/.5'
		10	2"SS	B-C	-	40 LL=76 PL=41	-	-	-		
MH	STIFF, MOTTLED BROWN CLAYEY SILT W/TRACES OF DECOMPOSED ROCK	15	2"S	B-D	108	31 LL=71 PL=38	83	6600	-		12/.5' 13/.3'
MH-CH	STIFF, MOTTLED RED SILTY CLAY	20	2"SS	B-E	-	31 LL=68 PL=33	-	-	-		44
	END OF BORING @ 21.5'										

* ELEVATION ESTIMATED FROM TOPO MAP DATED FEB. 22, 1971

WAIAU 2-A

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: WAIAU SUBDIVISION - UNIT 2-A
LOCATION: Waiau, Ewa, Oahu, Hawaii
Tax Map Key: 9-8-02: 3

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2" SS. 2" O.D. THIN WALL TUBE
2" SS. 2" STANDARD SPLIT SPOON

BORING NO. 9 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date JULY 7, 1971
Field Party MEYER, MAESHIRO, TSUKAZAKI
Type of Boring AUGER (ACKER ACE) Diam. 4"
Elev. 343'± * Datum —
Drill Bit T.C. DRAG

Water Level	NOT NOTICED			
Time	-			
Date	7-7-71			

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE BLOWS/0.5'
	ELEV.= 343'± *	0									
MH-CH	STIFF, DARK REDDISH BROWN, SILTY CLAY W/ ROOTS		2"SS	D-A	124	26 LL-58 PL-30	99	13,000+	-		5/5' 0/5'
(MH)	STIFF, REDDISH BROWN CLAYEY SILT	5	2"SS	D-B	-	34	-	-	-		
(MH)	STIFF, BROWN SILTY CLAY W/TRACES OF DECOMPOSED ROCK	10	2"SS	D-C	-	33	-	-	-		6/5' 8/5'
(MH)	STIFF, MOTTLED BROWN SILTY CLAY W/ DECOMPOSED ROCK	15	2"SS	D-D	-	42	-	-	-		
	END OF BORING @ 21'	20	2"SS	D-E	113	36	83	13,000+	-		12/5' 18/5'

* ELEVATION ESTIMATED FROM TOPO MAP DATED FEB. 22, 1971

WAIAU 2A

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: WAIAU SUBDIVISION - UNIT 2-A
LOCATION: Waiau, Ewa, Oahu, Hawaii
Tax Map Key: 9-8-02: 3

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2" S. 2" O.D. THIN WALL TUBE
2" SS. 2" STANDARD SPLIT SPOON

BORING NO. 10 Sheet No. _____ of _____
Driller W. LUM ASSOC., INC. Date JULY 12, 1971
Field Party MAESHIRO, TSUKAZAKI
Type of Boring AUGER (ACKER ACE) Diam. 4"
Elev. 270'± * Datum —
Drill Bit T.C. DRAG

Water Level	NOT NOTICED			
Time	-			
Date	7-12-71			

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE BLOWS/0.5'
	ELEV. = 270'± *	0	2"S	10-A	121	24	98	13,000+	-		7/.5' 7/.5'
(MH)	STIFF, REDDISH BROWN SILTY CLAY W/ROOTS	5	2"SS	10-B	-	26	-	-	-		28/.5'
(MH)	STIFF, BROWN CLAYEY SILT W/TRACES OF DECOMPOSED ROCK	10	2"S	10-C	116	32	88	5600	-		12/.5' 17/.5'
(MH)	STIFF, MOTTLED BROWN CLAYEY SILT W/ DECOMPOSED ROCK	15	2"SS	10-D	-	38	-	-	-		15/.5'
		20	2"SS	10-E	-	40	-	-	-		22/.5'
	END OF BORING @ 21'										

* ELEVATION ESTIMATED FROM TOPO MAP DATED FEB. 22, 1971

WAIAU 2A

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: WAIAU SUBDIVISION - UNIT 2-A
LOCATION: Waiau, Ewa, Oahu, Hawaii
Tax Map Key: 9-8-02: 3

HAMMER:
Weight: 140 #
Drop: 30"
SAMPLER: 2" S. 2" O.D. THIN WALL TUBE
2" SS. 2" STANDARD SPLIT SPOON

BORING NO. 11 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date JULY 12, 1971
Field Party MAESHIRO, TSUKAZAKI
Type of Boring AUGER (ACKER ACE) Diam. 4"
Elev. 310'± * Datum —
Drill Bit T.C. DRAG

Water Level	NOT NOTICED				
Time	-				
Date	7-12-71				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE BLOWS/0.5'
	ELEV. = 310'± *	0									
MH-CH	STIFF, REDDISH BROWN SILTY CLAY		2"S	11-A	-	28	-	10,000	-		4/.5' 4/.5'
(MH)	STIFF, REDDISH BROWN CLAYEY SILT	5	2"SS	11-B	-	32	-	-	-		
(MH)	STIFF, MOTTLED BROWN CLAYEY SILT	10	2"S	11-C	108	38	79	-	-		6/.5' 14/.5'
(MH)	STIFF, BROWN SILTY CLAY	15	2"SS	11-D	-	32	-	-	-		17/.5'
	END OF BORING @ 21'	20	2"SS	11-E	-	33	-	-	-		19/.5'

* ELEVATION ESTIMATED FROM TOPO MAP DATED FEB. 22, 1971

WAIAU - 2-A

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: WAIAU SUBDIVISION - UNIT 2-A
LOCATION: Waiau, Ewa, Oahu, Hawaii
Tax Map Key: 9-8-02: 3

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2" S·2" O.D. THIN WALL TUBE
2" SS·2" STANDARD SPLIT SPOON

BORING NO. 12 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date JULY 9, 1971
Field Party MAESHIRO, TSUKAZAKI
Type of Boring AUGER (ACKER ACE) Diam. 4"
Elev. 330'± * Datum ____
Drill Bit T.C. DRAG

Water Level	NOT NOTICED			
Time	-			
Date	7-9-71			

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE BLOWS/0.5'
	ELEV.= 330'± *	0									
(MH-CH)	STIFF, REDDISH BROWN SILTY CLAY W/ ROOTS		2"S	12-A	124	26	99	-	-		6/.5' 10/.5'
		5									
(MH)	STIFF, REDDISH BROWN SILTY CLAY W/TRACES OF DECOMPOSED ROCK		2"SS	12-B	-	32	-	-	-		18/.5'
		10									
(MH)	STIFF, REDDISH BROWN CLAYEY SILT W/ DECOMPOSED ROCK		2"S	12-C	116	36	85	5400	-		8/.5' 10/.5'
		15									
(MH-CH)	BROWN-GRAY SILTY CLAY W/ SOME DECOMPOSED ROCK		2"SS	12-D	-	33	-	-	-		24/.5'
		20									
	END OF BORING @ 21'		2"SS	12-E	-	30	-	-	-		20/.5'

* ELEVATION ESTIMATED FROM TOPO MAP DATED FEB. 22, 1971

WAIAU 2-A

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: WAIAU SUBDIVISION - UNIT 2-A
LOCATION: Waiau, Ewa, Oahu, Hawaii
Tax Map Key: 9-8-02: 3

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2" S - 2" O.D. THIN WALL TUBE
2" SS - 2" STANDARD SPLIT SPOON

BORING NO. 13 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date JULY 9, 1971
Field Party MAESHIRO, TSUKAZAKI
Type of Boring AUGER (ACKER ACE) Diam. 4"
Elev. 348' ± * Datum —
Drill Bit T.C. DRAG

Water Level	NOT NOTICED				
Time	-				
Date	7-9-71				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE BLOWS/0.5'
	ELEV. = 348' ± *	0									
(MH-CH)	STIFF, REDDISH BROWN SILTY CLAY W/ROOTS		2"S	13-A	118	27	92	13,000+	-		6/.5' 5/.5'
(MH)	STIFF, REDDISH BROWN CLAYEY SILT	5	2"SS	13-B	-	35	-	-	-		28/.5'
(MH)	STIFF, MOTTLED BROWN SILTY CLAY	10	2"S	13-C	112	41	80	10,100	-		10/.5' 10/.5'
(MH-CH)	STIFF, MOTTLED RED-BROWN SILTY CLAY	15	2"SS	13-D	-	38	-	-	-		18/.5'
	END OF BORING @ 21'	20	2"S	13-E	-	39	-	-	-		24/.5'

* ELEVATION ESTIMATED FROM TOPO MAP DATED FEB. 22, 1971

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: WAIAU SUBDIVISION - UNIT 2-A
LOCATION: Waiau, Ewa, Oahu, Hawaii
Tax Map Key: 9-8-02: 3

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2"SS- 2" STANDARD SPLIT SPOON
2"S- 2" O.D. THIN WALL TUBE

BORING NO. 14 Sheet No. ____ of ____
Driller: W. LUM ASSOC., INC. Date: JULY 16, 1971
Field Party: MAESHIRO, TSUKAZAKI
Type of Boring: AUGER (ACKER ACE) Diam.: 4"
Elev.: 240'± * Datum: —
Drill Bit: T.C. DRAG

Water Level				
Time	-			
Date	7-16-71			

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE BLOWS/0.5'
	ELEV. = 240'± *	0									
(MH-CH)	STIFF, REDDISH BROWN SILTY CLAY W/ROOTS, GRAVEL & TRACES OF DECOMPOSED ROCK		2"S	14-A	122	25	98	13,000	+ -		15/.5' 10/.5'
		5	2"SS	14-B	-	31	-	-	-		
(MH-CH)	STIFF, REDDISH BROWN, SILTY CLAY W/TRACES OF DECOMPOSED ROCK										
		10									
(CH)	STIFF, RED CLAY		2"S	14-C	124	31	94	13,000	+ -		7/.5' 11/.5'
	GRAY DECOMPOSED ROCK										
		15	2"SS	14-D	-	27	-	-	-		33/.2'
	GREENISH GRAY PUKA PUKA ROCK										
		20	2"SS	14-E	-	-	-	-	-		40/.2'
	END OF BORING @ 20.2'										

* ELEVATION ESTIMATED FROM TOPO MAP DATED FEB. 22, 1971

WAIAU 2-A

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: WAIAU SUBDIVISION - UNIT 2-A
LOCATION: Waiau, Ewa, Oahu, Hawaii
Tax Map Key: 9-8-02: 3

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2" SS - 2" STANDARD SPLIT SPOON

BORING NO. 15 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date JULY 12, 1971
Field Party MAESHIRO, TSUKAZAKI
Type of Boring AUGER (ACKER ACE) Diam. 4"
Elev. 270'± Datum —
Drill Bit T.C. DRAG

Water Level	NOT NOTICED			
Time	-			
Date	7-12-71			

Unified Soil Classification	DESCRIPTION ELEV. = 270'± *	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE BLOWS/0.5'
		0	2"S	15-A	118	24	95	-	-		10/5' 10/5'
MH	STIFF, REDDISH BROWN SILTY CLAY					LL-63 PL-32					
		5	2"SS	15-B	-	35	-	-	-		
						LL-63 PL-35					
MH	MEDIUM, REDDISH BROWN CLAYEY SILT	10	2"S	15-C	106	46	67	2860	-		3/5' 4/5'
						LL-73 PL-42					
(MH)	MOTTLED GRAY CLAYEY SILT W/DECOMPOSED ROCK	15	2"SS	15-D	-	46	-	-	-	10/5'	
	GRAY LAVA ROCK OR BOULDER		2"SS	15-E	-	13	-	-	-		50/3
	END OF BORING @ 17.8'	20									

* ELEVATION ESTIMATED FROM TOPO MAP DATED FEB. 22, 1971

WAIAU 2-A

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: WAIAU SUBDIVISION - UNIT 2-A
LOCATION: Waiau, Ewa, Oahu, Hawaii
Tax Map Key: 9-8-02: 3

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2"ss. 2" STANDARD SPLIT SPOON
2"S. 2" O.D. THIN WALL TUBE

BORING NO. 16 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date JULY 13, 1971
Field Party MAESHIRO, TSUKAZAKI
Type of Boring AUGER (ACKER ACE) Diam. 4"
Elev. 208'± * Datum -
Drill Bit T.C. DRAG
Water Level NOT NOTICED
Time -
Date 7-13-71

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE BLOWS/0.5'
	ELEV. = 208'± *	0									
(MH-CH)	STIFF, REDDISH BROWN SILTY CLAY		2"S	16-A	113	26	89	13,000+	-		6/.5' 6/.5'
		5	2"SS	16-B	-	27	-	-	-		
CH	STIFF, REDDISH BROWN & GRAY, CLAY					LL-80 PL-27					
		10	2"S	16-C	126	28	99	13,000+	-		14/.5' 17/.5'
	DECOMPOSED ROCK										
		15	2"SS	16-D	-	45	-	-	-		
MH	MEDIUM TO STIFF MOTTLED BROWN-RED, CLAYEY SILT										
		20	2"SS	16-E	-	52	-	-	-		6/.5'
	END OF BORING @ 21'					LL-66 PL-38					

* ELEVATION ESTIMATED FROM TOPO MAP DATED FEB. 22, 1971

WAIAU - 2A

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: WAIAU SUBDIVISION - UNIT 2-A
LOCATION: Waiau, Ewa, Oahu, Hawaii
Tax Map Key: 9-8-02: 3

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2"SS - 2" STANDARD SPLIT SPOON
2"S - 2" O.D. THIN WALL TUBE

BORING NO. 17 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date JULY 13, 1971
Field Party MAESHIRO, TSUKAZAKI
Type of Boring AUGER (ACKER ACE) Diam. 4"
Elev. 310'± * Datum —
Drill Bit T.C. DRAG

Water Level	NOT NOTICED				
Time	-				
Date	7-13-71				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE BLOWS/0.5'
	ELEV. = 310'± *	0	2"S	17-A	122	26	97	13,000+	-		8/.5' 16/.5'
(MH)	STIFF, REDDISH BROWN SILTY CLAY	5	2"SS	17-B	-	26	-	-	-		25/.5'
(MH)	MOTTLED REDDISH BROWN SILTY CLAY	10	2"S	17-C	114	31	86	8060	-		7/.5' 16/.5'
(MH)	STIFF, MOTTLED REDDISH BROWN SILTY CLAY	15	2"SS	17-D	-	44	-	-	-		
	END OF BORING @ 21'	20	2"SS	17-E	-	46	-	-	-		18/.5'

* ELEVATION ESTIMATED FROM TOPO MAP DATED FEB. 22, 1971

WAIAU SUBDIVISION - UNIT 2-A

TABLE I A - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	5	7	7	
SAMPLE NO.			B	
DEPTH BELOW SURFACE	SURFACE	SURFACE	5.0'-6.5'	
DESCRIPTION	REDDISH-BROWN CLAYEY SILT	REDDISH-BROWN CLAYEY SILT	REDDISH-BROWN CLAYEY SILT W/TRACES OF DECOMP. ROCK	
GRAIN-SIZE ANALYSIS (% Passing) Sieve				
1"				
1/2"				
#4				
#10				
#20				
#40				
#100				
#200				
ATTERBERG LIMITS				
Air Dried or Natural	NATURAL	NATURAL	NATURAL	
Liquid Limit	54	48	50	
Plastic Limit	31	29	32	
Plasticity Index	23	19	18	
Dilatancy	MEDIUM	MEDIUM	MED. QUICK	
Toughness	MEDIUM	SLIGHT-MEDIUM	SLIGHT-MED	
Dry Strength	MEDIUM	MEDIUM	SLIGHT-MED	
UNIFIED SOIL CLASSIFICATION	MH	ML	ML-MH	
APPARENT SPECIFIC GRAVITY		2.90		
EXPANSION AND CBR TESTS (Surcharge-51 P.S.F.)				
Molding Moisture, %	26.5	24.0		
Molding Dry Density, P.C.F.	97.9	99.9		
Swell upon saturation, %	0.7	1.5		
CBR at 0.1" Penetration	21.3	17.3		
MOISTURE-DENSITY RELATIONS OF SOILS (AASHO T-180-57 Method ___)		A		
Dry to Wet or Wet to Dry		DRY TO WET		
Max. Dry Density (P.C.F.)		99.8		
Optimum Moisture (%)		25.7		

REMARKS:

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 8-6-71 By BT

WAIAU SUBDIVISION - UNIT 2-A

TABLE I B - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	B	B	B	B
SAMPLE NO.	A	B	C	D
DEPTH BELOW SURFACE	0.0'-1.5'	5.0'-6.0'	10.0'-11.5'	15.0'-15.8'
DESCRIPTION	REDDISH-BROWN SILTY CLAY W/ROOTS	REDDISH-BROWN CLAYEY SILT	MOTTLED BROWN CLAYEY SILT W/TRACES OF DECOMP. ROCK	MOTTLED BROWN CLAYEY SILT W/TRACES OF DECOMP. ROCK
GRAIN-SIZE ANALYSIS (% Passing) Sieve				
1"				
1/2"				
#4				
#10				
#20				
#40				
#100				
#200				
ATTERBERG LIMITS				
Air Dried or Natural	NATURAL	NATURAL	NATURAL	NATURAL
Liquid Limit	62	53	76	71
Plastic Limit	30	35	41	38
Plasticity Index	32	18	35	33
Dilatancy	MEDIUM	QUICK	MEDIUM	MEDIUM
Toughness	MEDIUM	SLIGHT-MED	MEDIUM	MEDIUM
Dry Strength	MEDIUM	SLIGHT-MED	MEDIUM	MEDIUM
UNIFIED SOIL CLASSIFICATION	MH-CH	MH	MH	MH
APPARENT SPECIFIC GRAVITY				
EXPANSION AND CBR TESTS (Surcharge-51 P.S.F.)				
Molding Moisture, %				
Molding Dry Density, P.C.F.				
Swell upon saturation, %				
CBR at 0.1" Penetration				
MOISTURE-DENSITY RELATIONS OF SOILS (AASHO T-180-57 Method ___)				
Dry to Wet or Wet to Dry				
Max. Dry Density (P.C.F.)				
Optimum Moisture (%)				

REMARKS:

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 8-6-71 By B.T

WAIAU SUBDIVISION - UNIT 2-A

TABLE I C - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	8	9	9	11
SAMPLE NO.	E		A	
DEPTH BELOW SURFACE	20.0'-21.5'	SURFACE	0.0'- 1.0'	SURFACE
DESCRIPTION	MOTTLED RED SILTY CLAY	REDDISH-BROWN SILTY CLAY	DARK REDDISH-BROWN SILTY CLAY W/ROOTS	REDDISH-BROWN SILTY CLAY
GRAIN-SIZE ANALYSIS (% Passing) Sieve				
1"				
1/2"				
#4				
#10				
#20				
#40				
#100				
#200				
ATTERBERG LIMITS				
Air Dried or Natural	NATURAL	NATURAL	NATURAL	NATURAL
Liquid Limit	68	50	58	53
Plastic Limit	33	27	30	30
Plasticity Index	35	21	28	23
Dilatancy	MEDIUM	MED. QUICK	SLOW-MED	MED. QUICK
Toughness	MEDIUM	SLIGHT-MED	MED-HIGH	MEDIUM
Dry Strength	MED.-HIGH	MEDIUM	MEDIUM	MEDIUM
UNIFIED SOIL CLASSIFICATION	MH-CH	ML-MH	MH-CH	MH
APPARENT SPECIFIC GRAVITY		2.89		2.89
EXPANSION AND CBR TESTS (Surcharge-51 P.S.F.)				
Molding Moisture, %		24.2		25.9
Molding Dry Density, P.C.F.		100.0		97.4
Swell upon saturation, %		1.4		0.6
CBR at 0.1" Penetration		16.5		16.2
MOISTURE-DENSITY RELATIONS OF SOILS (AASHO T-180-57 Method ___)		A		A
Dry to Wet or Wet to Dry		DRY TO WET		DRY TO WET
Max. Dry Density (P.C.F.)		100.4		99.1
Optimum Moisture (%)		25.4		25.9

REMARKS:

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 8-6-71 By B.T

WAIAU SUBDIVISION - UNIT 2-A

TABLE I 0 - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	12	15	15	15
SAMPLE NO.		A	B	C
DEPTH BELOW SURFACE	SURFACE	0.0'- 1.0'	5.0'- 6.5'	10.0'- 11.0'
DESCRIPTION	REDDISH-BROWN SILTY CLAY	REDDISH-BROWN SILTY CLAY	REDDISH-BROWN CLAYEY SILT	REDDISH-BROWN CLAYEY SILT
GRAIN-SIZE ANALYSIS (% Passing) Sieve				
1"				
1/2"				
#4				
#10				
#20				
#40				
#100				
#200				
ATTERBERG LIMITS				
Air Dried or Natural	NATURAL	NATURAL	NATURAL	NATURAL
Liquid Limit	54	63	63	73
Plastic Limit	29	32	35	42
Plasticity Index	25	31	28	31
Dilatancy	SLOW-MED	SLOW-MED	MEDIUM	MEDIUM
Toughness	MED-HIGH	MED-HIGH	MEDIUM	MEDIUM
Dry Strength	MED.-HIGH	MEDIUM	SLIGHT-MED.	MEDIUM
UNIFIED SOIL CLASSIFICATION	MH-CH	MH	MH	MH
APPARENT SPECIFIC GRAVITY				
EXPANSION AND CBR TESTS (Surcharge-51 P.S.F.)				
Molding Moisture, %	24.1			
Molding Dry Density, P.C.F.	97.4			
Swell upon saturation, %	2.6			
CBR at 0.1" Penetration	8.5			
MOISTURE-DENSITY RELATIONS OF SOILS (AASHO T-180-57 Method ___)				
Dry to Wet or Wet to Dry				
Max. Dry Density (P.C.F.)				
Optimum Moisture (%)				

REMARKS:

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 8-6-71 By B.T

WAIAU SUBDIVISION - UNIT 2-A

TABLE I E - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	16	16		
SAMPLE NO.	B	E		
DEPTH BELOW SURFACE	5.0'-6.5'	20.0'-21.0'		
DESCRIPTION	REDDISH-BROWN & GRAY CLAY	MOTTLED BROWN-RED CLAYEY SILT		
GRAIN-SIZE ANALYSIS (% Passing)				
Sieve 1"				
1/2"				
#4				
#10				
#20				
#40				
#100				
#200				
ATTERBERG LIMITS				
Air Dried or Natural	NATURAL	NATURAL		
Liquid Limit	80	66		
Plastic Limit	27	38		
Plasticity Index	53	28		
Dilatancy	NONE-VERY SLOW	MEDIUM		
Toughness	MED-HIGH	MED-HIGH		
Dry Strength	MED.-HIGH	MEDIUM		
UNIFIED SOIL CLASSIFICATION	CH	MH		
APPARENT SPECIFIC GRAVITY				
EXPANSION AND CBR TESTS (Surcharge-51 P.S.F.)				
Molding Moisture, %				
Molding Dry Density, P.C.F.				
Swell upon saturation, %				
CBR at 0.1" Penetration				
MOISTURE-DENSITY RELATIONS OF SOILS (AASHO T-180-57 Method ___)				
Dry to Wet or Wet to Dry				
Max. Dry Density (P.C.F.)				
Optimum Moisture (%)				

REMARKS:

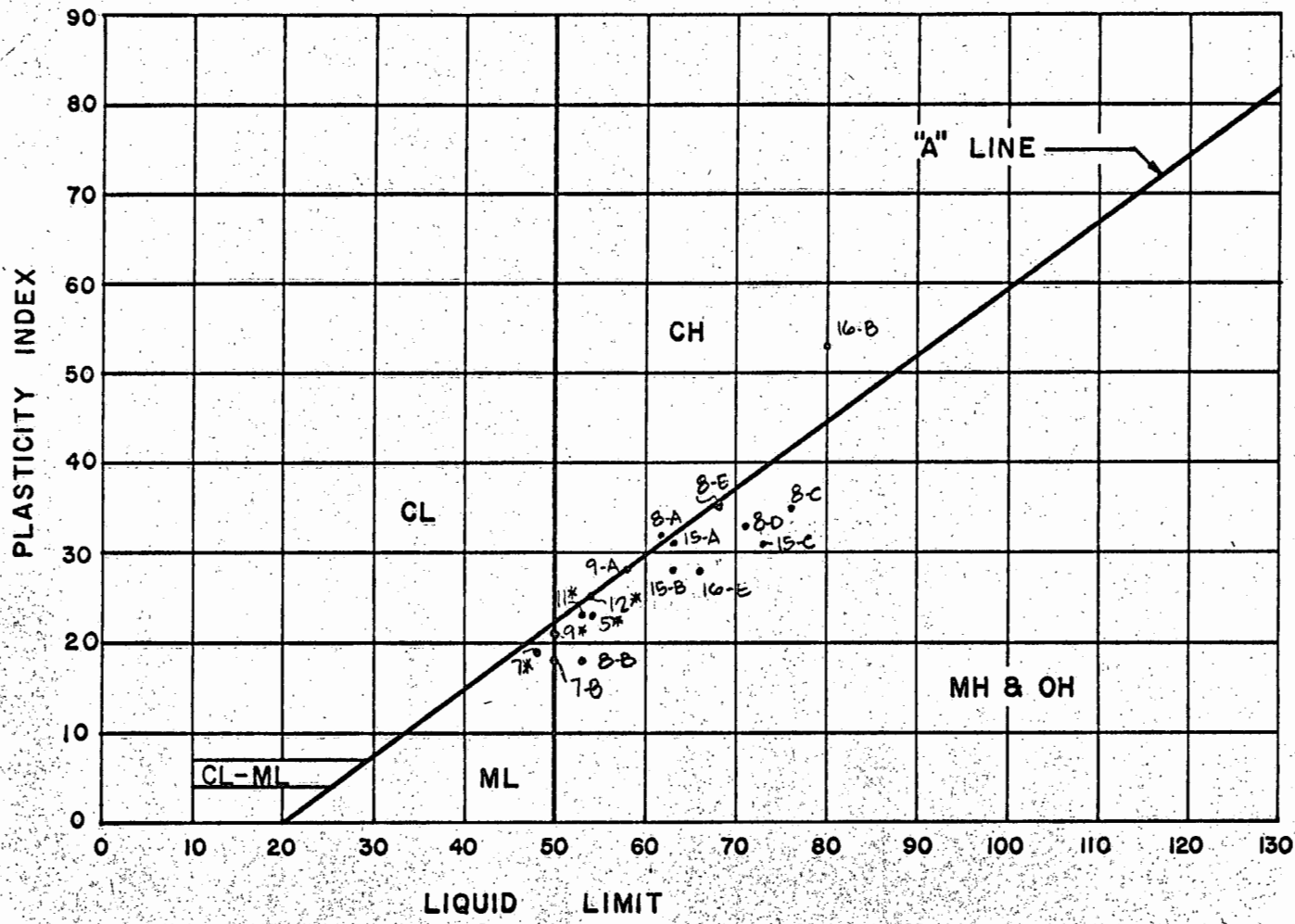
WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 8-6-71 By BT

PLASTICITY CHART

PROJECT: WAIAU SUBDIVISION - UNIT 2-A

LOCATION:



DATE 8-5-71 BY BT

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

MOISTURE-DENSITY CURVE (AASHO T-180-57, METHOD A)

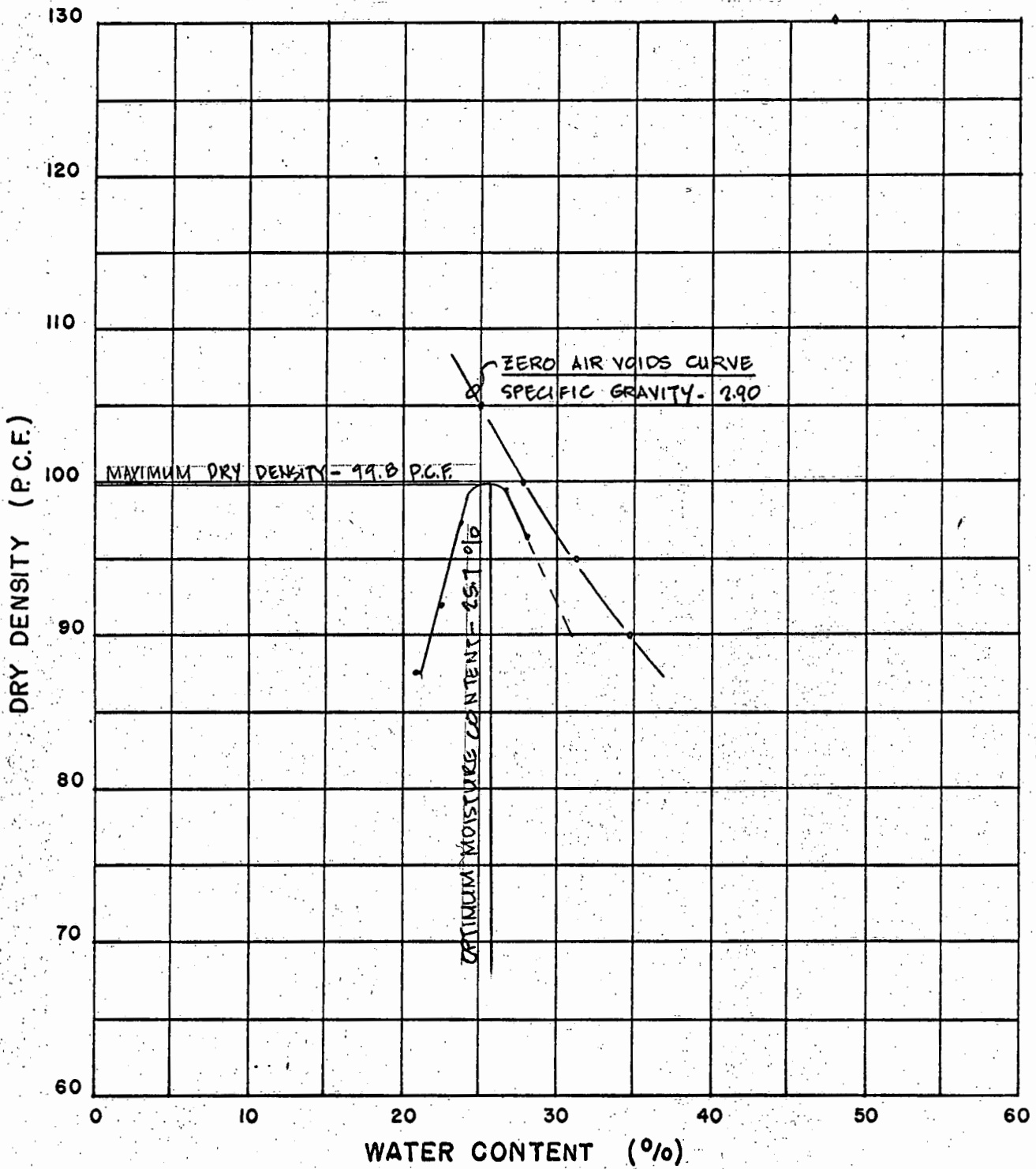
PROJECT: WAIAU SUBDIVISION - UNIT 2-A

LOCATION: WAIAU, OAHU, HAWAII

SAMPLE NO.: BORING # 7 SURFACE

SAMPLE DESCRIPTION: REDDISH-BROWN CLAYEY SILT

AGGREGATE: 1/4" MINUS
MOLD SIZE: 4" & 4.59"
HAMMER: 10LBS., 18"DROP
LAYERS: 5
BLOWS: 25/LAYER



WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

DATE 1-14-71 BY ST

MOISTURE–DENSITY CURVE (AASHO T-180-57, METHOD A)

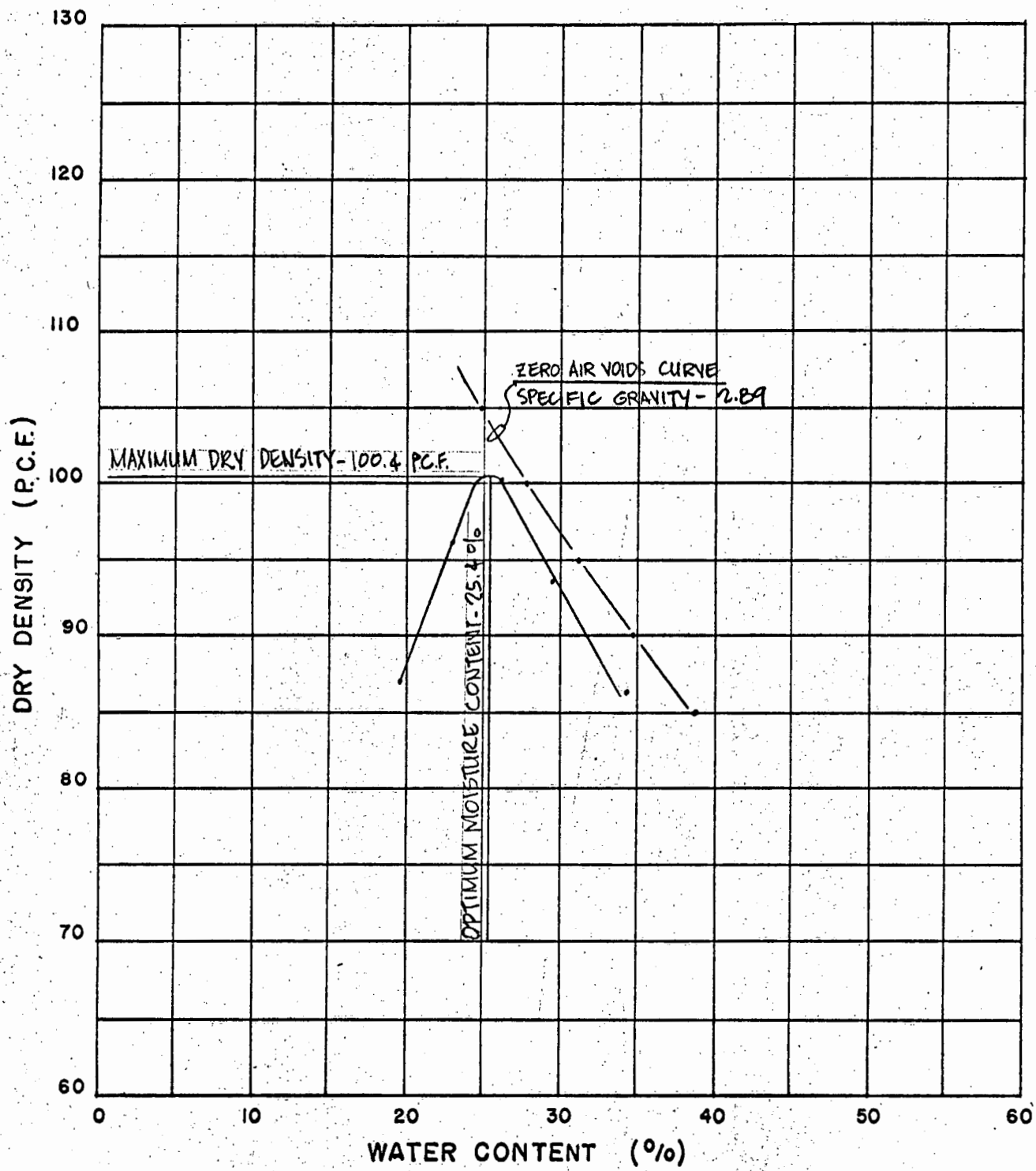
PROJECT: WAIAU SUBDIVISION · UNIT 2-A

LOCATION: WAIAU , OAHU , HAWAII

SAMPLE NO.: BORING # 2 SURFACE

SAMPLE DESCRIPTION: REDDISH-BROWN SILTY CLAY

AGGREGATE: ¼" MINUS
MOLD SIZE: 4" & 4.59" HEIGHT
HAMMER: 10 LBS., 18" DROP
LAYERS: 5
BLOWS: 25/LAYER



WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

DATE 7-20-71 BY ST

9-470

MOISTURE–DENSITY CURVE (AASHO T-180-57, METHOD A)

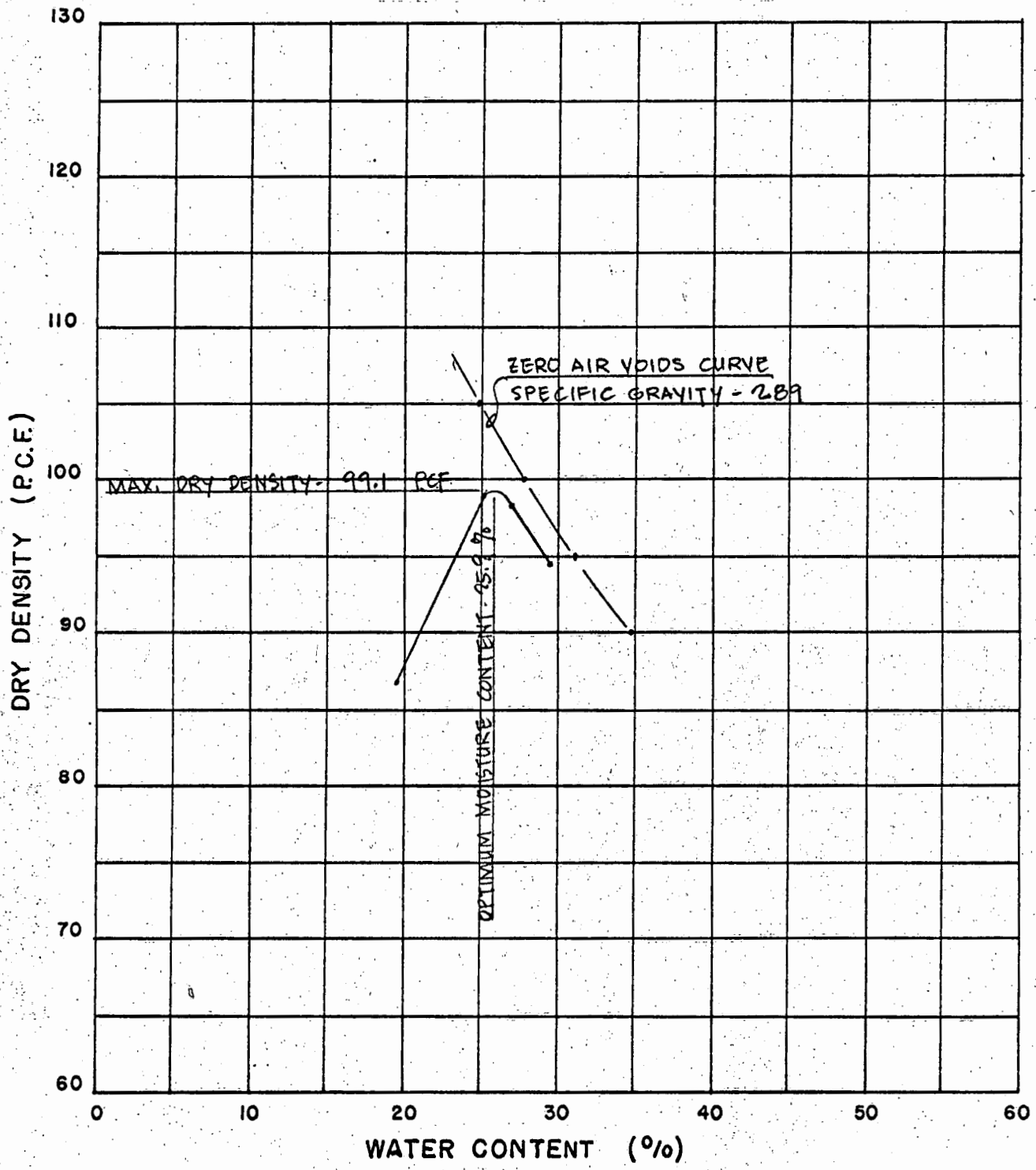
PROJECT: WAIAU SUBDIVISION - UNIT 2-A

LOCATION: WAIAU , OAHU , HAWAII

SAMPLE NO.: BORING #11 SURFACE

SAMPLE DESCRIPTION: REDDISH-BROWN SILTY CLAY

AGGREGATE: 1/4" MINUS
MOLD SIZE: 4"ϕ X 4.59" HIGH
HAMMER: 10 LBS., 18" DROP
LAYERS: 5
BLOWS: 25/LAYER



WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

DATE 8-4-71 BY BT.

9-470

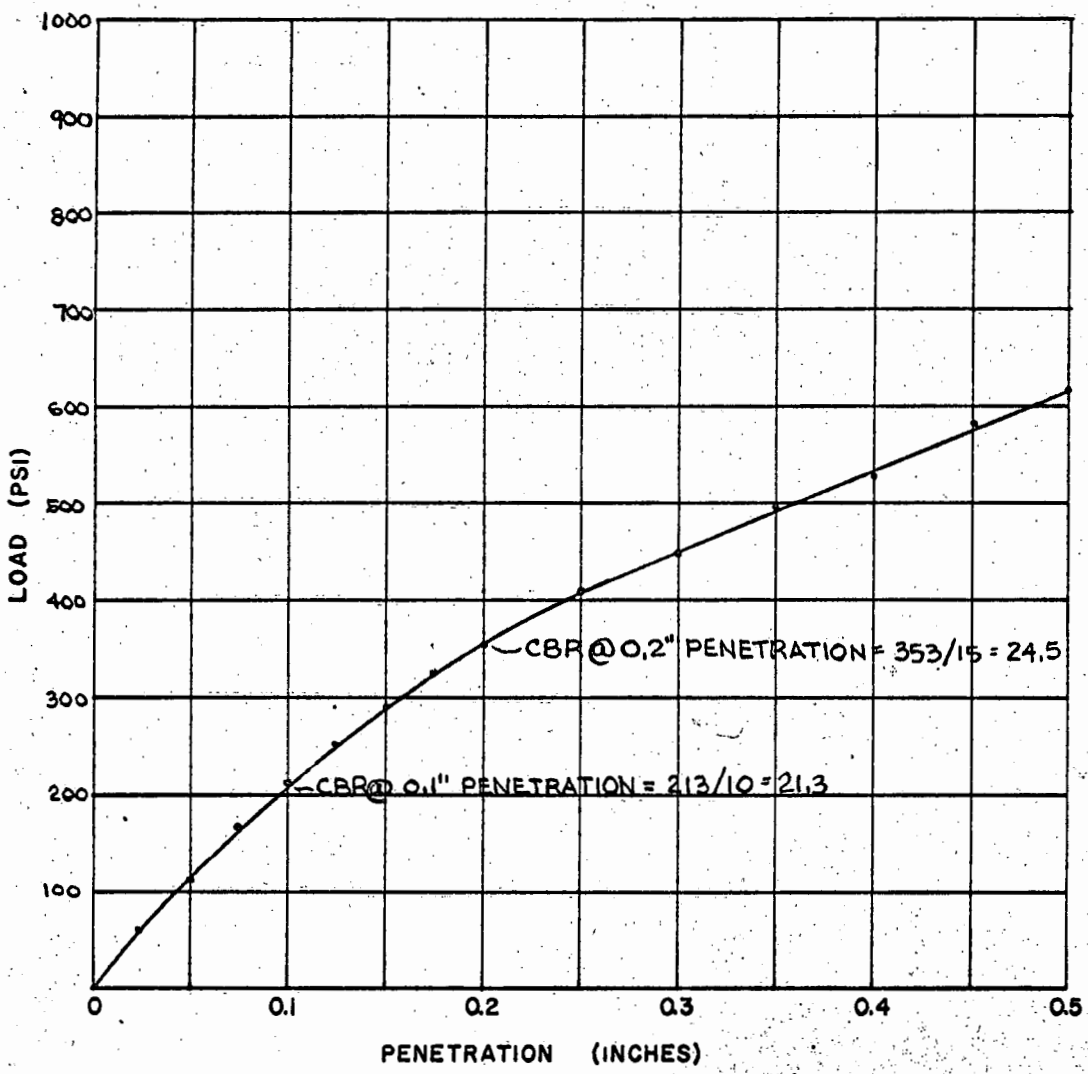
CBR TEST

PROJECT: WAIAU SUBDIVISION - UNIT 2-A

LOCATION: WAIAU, OAHU, HAWAII

SAMPLE NO: BORING #5 SURFACE

SAMPLE DESCRIPTION: REDDISH-BROWN CLAYEY SILT



CBR PENETRATION DATA

PENETRATION (INCHES)	LOAD (LBS.)	LOAD (PSI)
0.025	180	60
0.050	340	113
0.075	510	170
0.100	640	213
0.125	760	253
0.150	870	290
0.175	970	323
0.200	1060	353
0.250	1230	410
0.300	1340	447
0.350	1490	497
0.400	1580	527
0.450	1740	580
0.500	1850	617

AGGREGATE 1/4" MINUS

HAMMER WEIGHT 10 LBS

HAMMER DROP 18"

No. OF BLOWS 56/LAYER

No. OF LAYERS 5

TEST RESULTS:

MOLDING MOISTURE, %. 26.5

MOLDING DRY DENSITY, P.C.F. 97.9

CBR @ 0.1" PENETRATION 21.3

DAYS SOAKED 5

DATE 7-23-71 BY SP & PWP

DATE 7-26-71 BY JI

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

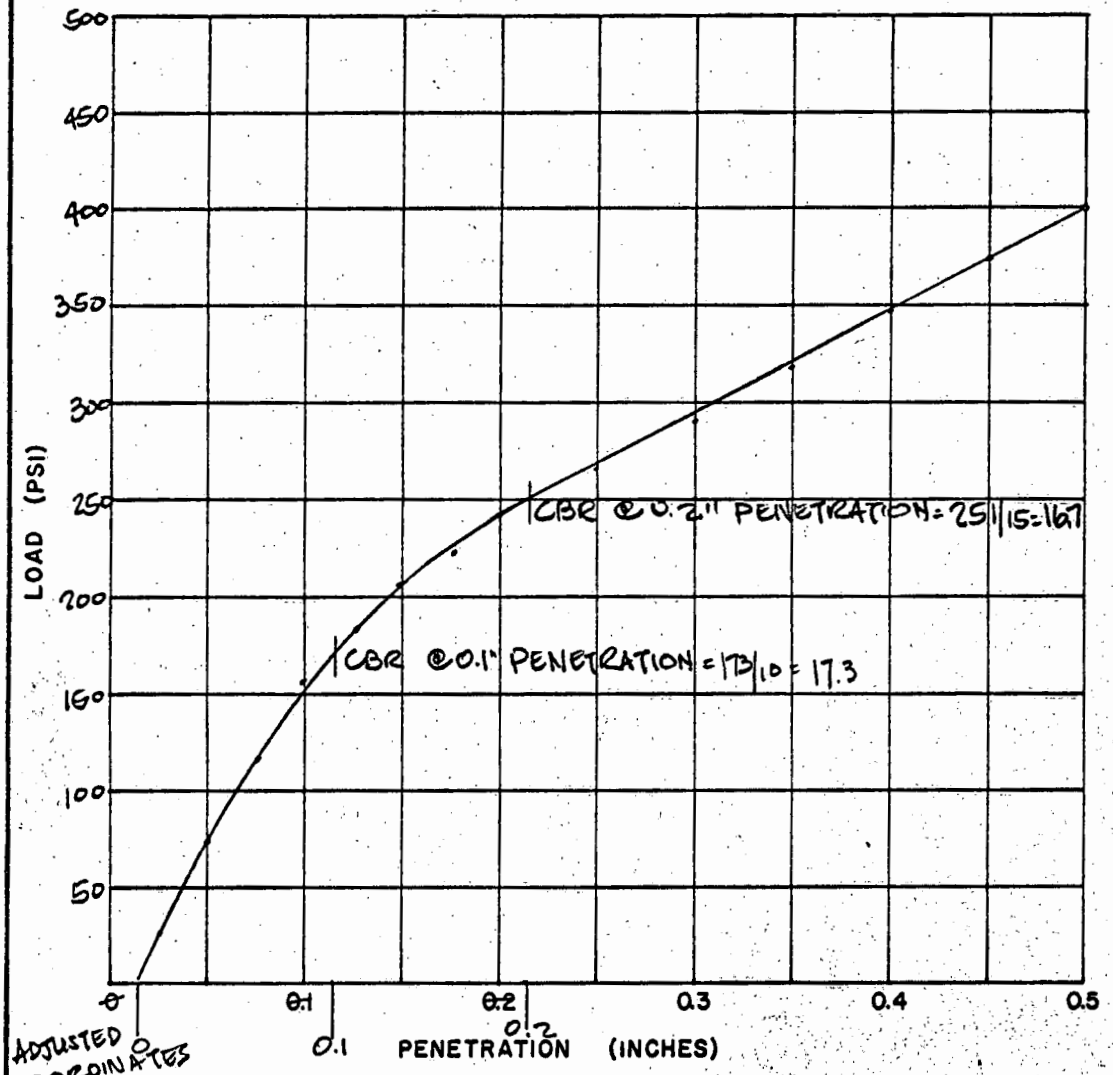
CBR TEST

PROJECT: WAIAU SUBDIVISION - UNIT 2-A

LOCATION: WAIAU , OAHU , HAWAII

SAMPLE NO: BORING #7 SURFACE

SAMPLE DESCRIPTION: REDDISH-BROWN CLAYEY SILT



CBR PENETRATION DATA

PENETRATION (INCHES)	LOAD (LBS.)	LOAD (PSI)
0.025	80	27
0.050	220	73
0.075	350	117
0.100	470	157
0.125	550	183
0.150	620	207
0.175	670	223
0.200	730	243
0.250	800	267
0.300	870	290
0.350	950	317
0.400	1040	347
0.450	1120	373
0.500	1200	400

AGGREGATE 1/4" MINUS

HAMMER WEIGHT 10LBS.

HAMMER DROP 18"

No. OF BLOWS 56/LAYER

No. OF LAYERS 5

TEST RESULTS:

MOLDING MOISTURE, %. 24.0

MOLDING DRY DENSITY, P.C.F. 99.9

CBR @ 0.1" PENETRATION 17.3

DAYS SOAKED 4

DATE 7-13-71 BY WY

DATE 7-19-71 BY SY

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

10-470

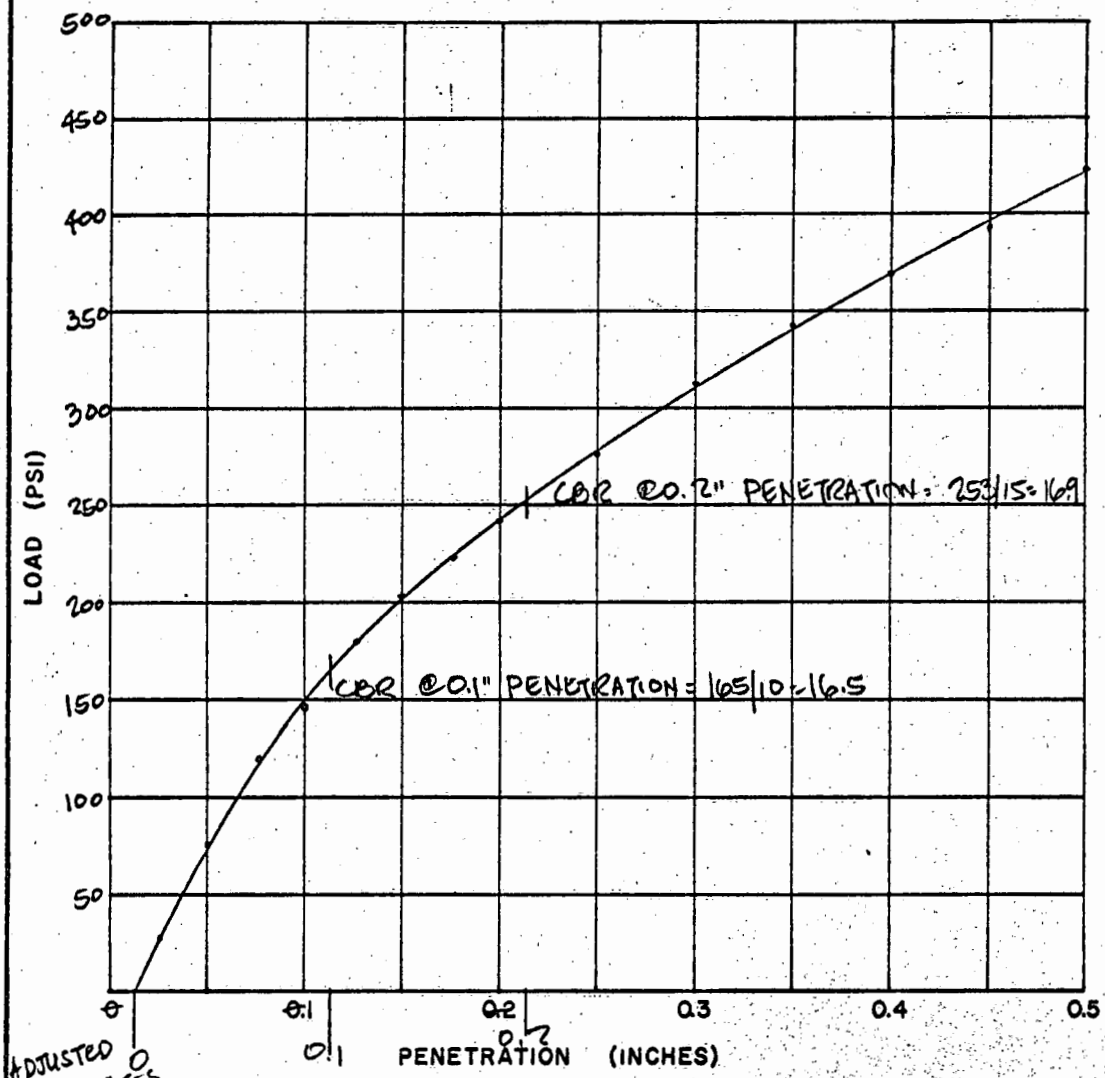
CBR TEST

PROJECT: WAIAU SUBDIVISION - UNIT 2-A

LOCATION: WAIAU, OAHU, HAWAII

SAMPLE NO: BORING #2 SURFACE

SAMPLE DESCRIPTION: REDDISH-BROWN SILTY CLAY



CBR PENETRATION DATA

PENETRATION (INCHES)	LOAD (LBS.)	LOAD (PSI)
0.025	80	27
0.050	230	77
0.075	360	120
0.100	440	147
0.125	540	180
0.150	610	203
0.175	670	223
0.200	730	243
0.250	830	277
0.300	940	313
0.350	1030	343
0.400	1110	370
0.450	1180	393
0.500	1270	423

AGGREGATE ¼" MINUS

HAMMER WEIGHT 10 LBS.

HAMMER DROP 18"

No. OF BLOWS 56/LAYER

No. OF LAYERS 5

TEST RESULTS:

MOLDING MOISTURE, %. 24.2

MOLDING DRY DENSITY, P.C.F. 100.0

CBR @ 0.1" PENETRATION 16.5

DAYS SOAKED 4

DATE 7-13-71 BY WY

DATE 7-19-71 BY ST

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

10-470

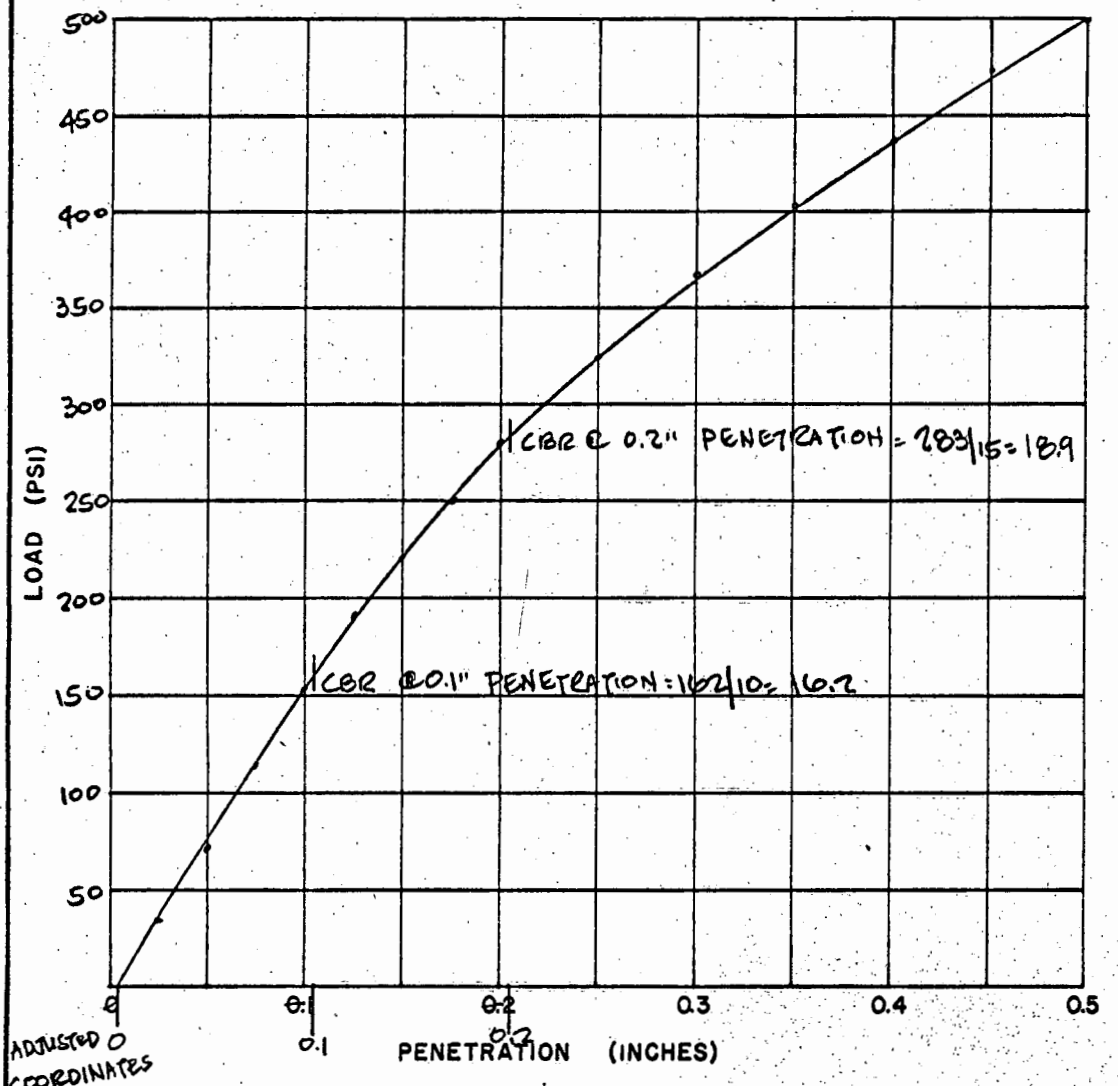
CBR TEST

PROJECT: WAIAU SUBDIVISION - UNIT 2-A

LOCATION: WAIAU , OAHU , HAWAII

SAMPLE NO: BORING #11 SURFACE

SAMPLE DESCRIPTION: REDDISH-BROWN SILTY CLAY



CBR PENETRATION DATA

PENETRATION (INCHES)	LOAD (LBS.)	LOAD (PSI)
0.025	95	32
0.050	210	70
0.075	340	113
0.100	460	153
0.125	570	190
0.150	660	220
0.175	750	250
0.200	840	280
0.250	970	323
0.300	1100	367
0.350	1210	403
0.400	1310	437
0.450	1420	473
0.500	1500	500

AGGREGATE 1/4" MINUS

HAMMER WEIGHT 10LBS.

HAMMER DROP 18"

No. OF BLOWS 56/LAYER

No. OF LAYERS 5

TEST RESULTS:

MOLDING MOISTURE, %. 25.9

MOLDING DRY DENSITY, P.C.F. 97.4

CBR @ 0.1" PENETRATION 16.2

DAYS SOAKED 4

DATE 7-13-71 BY PP

DATE 7-19-71 BY ST

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

10-470

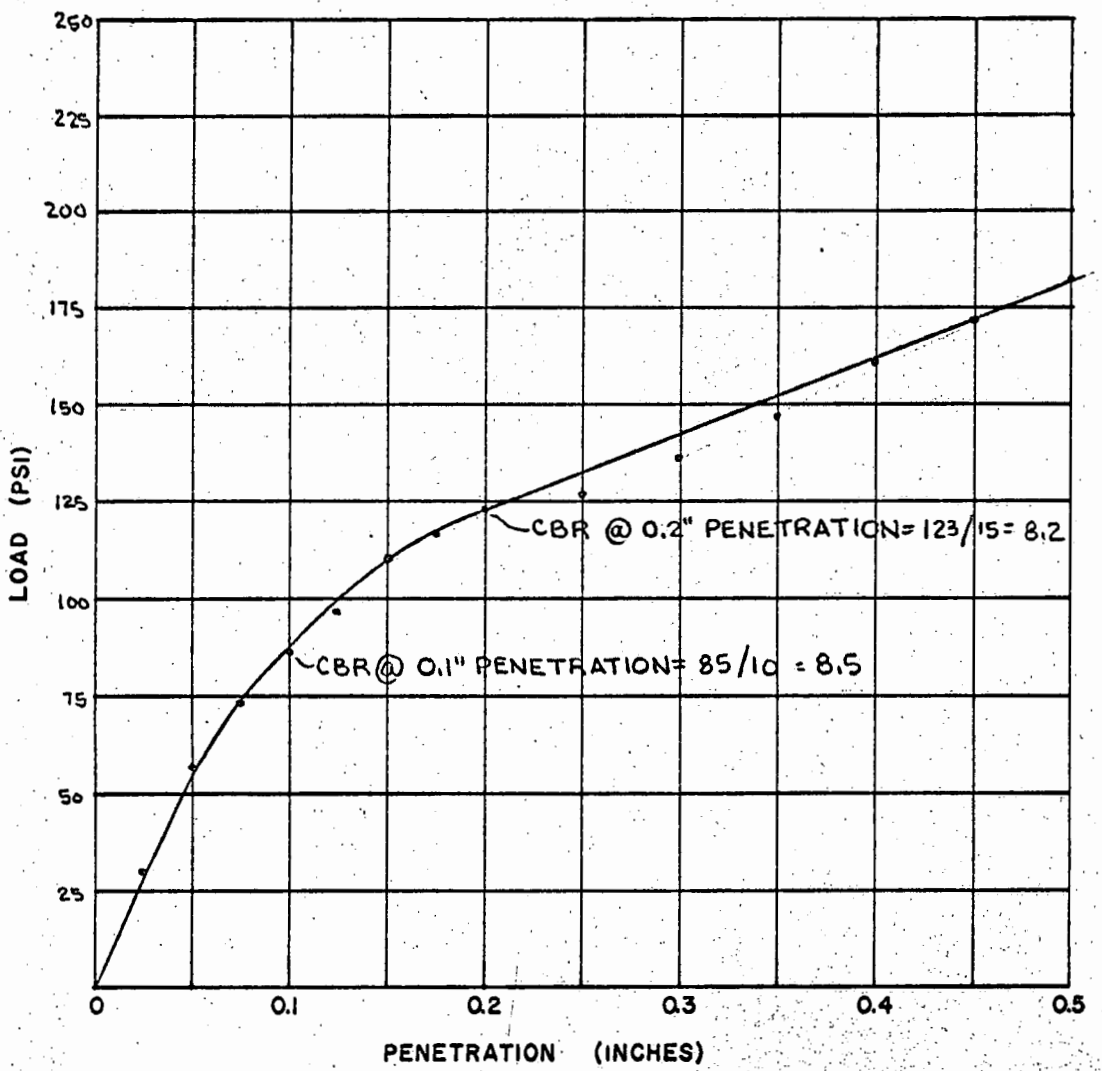
CBR TEST

PROJECT: WAIAU SUBDIVISION - UNIT 2-A

LOCATION: WAIAU, OAHU, HAWAII

SAMPLE NO: BORING #12 SURFACE

SAMPLE DESCRIPTION: REDDISH-BROWN SILTY CLAY



CBR PENETRATION DATA

PENETRATION (INCHES)	LOAD (LBS)	LOAD (PSI)
0.025	90	30
0.050	170	57
0.075	220	73
0.100	260	87
0.125	290	97
0.150	330	110
0.175	350	117
0.200	370	123
0.250	380	127
0.300	410	137
0.350	440	147
0.400	480	160
0.450	515	172
0.500	550	183

AGGREGATE 1/4" MINUS

HAMMER WEIGHT 10LBS

HAMMER DROP 18"

No. OF BLOWS 56/LAYER

No. OF LAYERS 5

TEST RESULTS:

MOLDING MOISTURE, %. 24.1

MOLDING DRY DENSITY, P.C.F. 97.4

CBR @ 0.1" PENETRATION 8.5

DAYS SOAKED 5

DATE 7-23-71 BY PP & SP

DATE 7-26-71 BY JI

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

LOGS OF BORINGS

FROM

WAIAU SUBDIVISION - UNIT 1

Report dated September 23, 1969

WALTER LUM ASSOCIATES — 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 •

Boring Log

PROJECT: WAIAU DEVELOPMENT-UNIT I
LOCATION: WAIAU, EWA, OAHU, HAWAII
TMK: 9-8-02:3

HAMMER:
Weight: 140 #
Drop: 30"
SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 28 Sheet No. ____ of ____
Driller: WALTER LUM ASSOC. Date: AUG. 18, 1969
Field Party: LEE, MAU, MAKAULA
Type of Boring: AUGER (MOBILE MINUTEMAN) Diam.: 3"
Elev.: 266'± * Datum: —
Drill Bit: T.C. DRAG

Water Level				
Time	—			
Date	8-18-69			

PENETRATION DATA: STANDARD PENETRATION TEST (Blows Per Foot 0 10 20 30 40) | 2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Moist. Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Lab. Torvane Shear P.S.F.
	ELEV. = 266'± *	0							
(ML)	VERY STIFF, REDDISH BROWN, CLAYEY SILT	5		28-A	-	28	-	-	-
				28-B	-	34	-	-	-
		10		28-C	-	41	-	-	-
(MH)	VERY STIFF, BROWN CLAYEY SILT								
		15		28-D	-	34	-	-	-
(MH)	VERY STIFF, BROWN CLAYEY SILT W/ DECOMPOSED ROCK								
		20		28-E	-	35	-	-	-
(MH)	VERY STIFF, GRAY-REDDISH BROWN SILTY CLAY								
	END OF BORING @ 21.5'								

* ELEVATION ESTIMATED FROM CONTOUR MAP

WALTER LUM ASSOCIATES

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 •

Boring Log

PROJECT: WAIAU DEVELOPMENT-UNIT I
LOCATION: WAIAU, EWA, OAHU, HAWAII
TMK: 9-8-02:3

HAMMER:
Weight: 140 #
Drop: 30"
SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 29 Sheet No. ____ of ____
Driller: WALTER LUM ASSOC. Date: AUG. 22, 1969
Field Party: HASHIDA, LEE, MAU
Type of Boring: AUGER (MOBILE MINUTEMAN) Diam.: 3"
Elev.: 270'± * Datum: —
Drill Bit: T.C. DRAG
Water Level: NOT NOTICED
Time: —
Date: 8-22-69

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Moist. Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Lab. Torvane Shear P.S.F.
	ELEV. = 270'± *	0							
ML	MEDIUM, REDDISH BROWN, CLAYEY SILT			29-A	-	33	-	-	-
(MH)	VERY STIFF, DARK REDDISH BROWN CLAYEY SILT	5		29-B	-	28	-	-	-
(MH)	VERY STIFF, BROWN CLAYEY SILT	10		29-C	-	35	-	-	-
(MH)	STIFF, REDDISH BROWN CLAYEY SILT	15		29-D	-	37	-	-	-
	END OF BORING @ 16.5'								

PENETRATION DATA
STANDARD PENETRATION TEST — Blows Per Foot: 0 10 20 30 40
2" O.D. THIN WALL TUBE SAMPLER — BLOWS/0.5'

* ELEVATION ESTIMATED FROM CONTOUR MAP

WALTER LUM ASSOCIATES

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: WAIAU DEVELOPMENT-UNIT I

LOCATION: WAIAU, EWA, OAHU, HAWAII

TMK: 9-8-02:3

HAMMER:

Weight: 140 #

Drop: 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 34 Sheet No. _____ of _____

Driller: WALTER LUM ASSOC. Date: AUGUST 19, 1969

Field Party: SUZUKI, HASHIDA

Type of Boring: AUGER (ACKER ACE) Diam.: 4"

Elev.: 268' I * Datum: _____

Drill Bit: T.C. DRAG

Water Level				
Time	—			
Date	8-19-69			

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Moist. Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Lab. Torvane Shear P.S.F.	PENETRATION DATA: STANDARD PENETRATION TEST, Blows Per Foot (0 10 20 30 40)
	ELEV. = 268' I *	0								
(ML)	STIFF REDDISH BROWN CLAYEY SILT			34-A	-	25	-	-	-	
(ML)	VERY STIFF, REDDISH BROWN, CLAYEY SILT			34-B	-	30	-	-	-	
	ROCK	10								
				34-C	-	33 32	-	-	-	
(MH)	STIFF, REDDISH BROWN CLAYEY SILT W/ DECOMPOSED ROCK			34-D	-	47	-	-	+	
		20		34-E	-	42	-	-	-	
	END OF BORING @ 21.5'									

* ELEVATION ESTIMATED FROM CONTOUR MAP

M's
7/69

WALTER LUM ASSOCIATES

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 •

Boring Log

BORING NO. 47 Sheet No. 1 of 1

PROJECT WAIAU DEVELOPMENT-UNIT I

Driller WALTER LUM ASSOC. Date AUGUST 2, 1969

LOCATION WAIAU, EWA, OAHU, HAWAII

TMK: 9-8-02:3

Field Party KAKU, OSHIRO

Type of Boring AUGER (MOBILE MINUTEMAN) Diam. 3"

Elev. 246' ± * Datum —

Drill Bit T.C. DRAG

HAMMER:

Weight 140 #

Drop 30"

SAMPLER: 2" STANDARD SPLIT SPOON

Water Level	NOT NOTICED		
Time	—		
Date	8-2-69		

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Moist. Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Lab. Torvane Shear P.S.F.	PENETRATION DATA: STANDARD PENETRATION TEST Blows Per Foot (0 10 20 30 40) / 2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
	ELEV. ± 246' ± *	0								
(ML)	STIFF, REDDISH BROWN CLAYEY SILT			47-A	-	23	-	-	-	
(MH)	STIFF, DARK BROWN CLAYEY SILT	5		47-B	-	42	-	-	-	
	STIFF, BROWN CLAYEY SILT	10		47-C	-	25	-	-	-	
(MH)	VERY STIFF, BROWN CLAYEY SILT W/ DECOMPOSED ROCK	15		47-D	-	46	-	-	-	
(MH)	VERY STIFF, DARK BROWN, SILTY CLAY & DECOMPOSED ROCK	20		47-E	-	43	-	-	-	
	END OF BORING @ 26'	25		47-F	-	-	-	-	-	10/0.5

* ELEVATION ESTIMATED FROM CONTOUR MAP

WALTER LUM ASSOCIATES

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 •

Boring Log

PROJECT: WAIAU DEVELOPMENT-UNIT I

LOCATION: WAIAU, EWA, OAHU, HAWAII

TMK: 9-8-02:3

HAMMER:

Weight: 140 #

Drop: 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 48 Sheet No. 1 of 1

Driller: WALTER LUM ASSOC. Date: AUGUST 19, 1969

Field Party: MAKAULA, MAU, LEE

Type of Boring: AUGER (MOBILE MINUTEMAN) Diam.: 3"

Elev.: 270'± * Datum: —

Drill Bit: T. C. DRAG

Water Level: NOT NOTICED

Time: —

Date: 8-9-69

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Moist. Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Lab. Torvane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, Blows Per Foot (0 10 20 30 40) / 2" O.D. Thin Wall Tube Sampler, Blows/0.5'
	ELEV. = 270'± *	0								
(ML)	STIFF, REDDISH BROWN CLAYEY SILT			48-A	-	22	-	-	-	
		5		48-B	-	30	-	-	-	
(ML)	STIFF TO VERY STIFF, REDDISH BROWN CLAYEY SILT	10		48-C	-	40	-	-	-	
		15		48-D	-	34	-	-	-	
(MH)	STIFF TO VERY STIFF, BROWN, SILTY CLAY	20		48-E	-	40	-	-	-	
	END OF BORING @ 21.5'									

* ELEVATION ESTIMATED FROM CONTOUR MAP

GENERAL TESTING METHODS

EXPLORATORY BORINGS AND SAMPLING

Method for soil investigation and sampling by auger borings (Tentative)	ASTM Designation: D 1452-63T
Method for thin wall tube sampling of soils (Tentative)	ASTM Designation: D 1587-63T
Method for penetration test and split barrel sampling of soils (Tentative)	ASTM Designation: D 1586-64T

LABORATORY TESTING

Grading Analysis

Sieve analysis of fine and coarse aggregates	AASHO Designation: T 27-60
Amount of material finer than No. 200 sieve in aggregate	AASHO Designation: T 11-60

Atterberg Limits

Determining the liquid limit of soils Modified as follows: Substitute Casagrande grooving tool. Tests conducted from natural moisture content unless noted otherwise.	AASHO Designation: T 89-60
Determining the plastic limit of soils	AASHO Designation: T 90-56
Calculating the plasticity index of soils	AASHO Designation: T 91-54

Specific Gravity

Specific gravity of soils Modified as follows: 500 ML Pycnometer	AASHO Designation: T 100-60

Expansion and CBR Tests

Expansion test and California Bearing Ratio (CBR)	Section VIII - TM 5-530 "Materials Testing" by Headquarters, Dept. of the Army

Compaction Test

Moisture-Density relations of soils using a 10# rammer and an 18" drop	AASHO Designation: T 180-57

Unified Soil Classification

Designation E-3 from "Earth Manual" by the United States Department of the Interior Bureau of Reclamation

GENERAL TESTING METHODS

Consolidation Test

Chapter IX
"Soil Testing for Engineers"
by T. William Lambe
The Massachusetts Institute
of Technology

Laboratory Shear Test

Laboratory shear test using the Torvane

Brochure by Soiltest, Inc.

LIMITATIONS

In general, soil formations are commonly erratic and rarely uniform or regular. The boring logs indicate the approximate subsurface soil conditions encountered only at the drill holes where the borings were made at the times designated on the logs and may not represent conditions at other locations or at other dates. Soil conditions and water levels may change with the passage of time and construction methods or improvements at the site.

During construction, should subsurface conditions much different from those in the borings be observed, encountered, or otherwise indicated, we should be advised immediately to review or reconsider our recommendations in light of the new developments.

Our professional services were performed, findings obtained and recommendations prepared in accordance with generally accepted engineering practices. This warranty is in lieu of all other warranties expressed or implied.

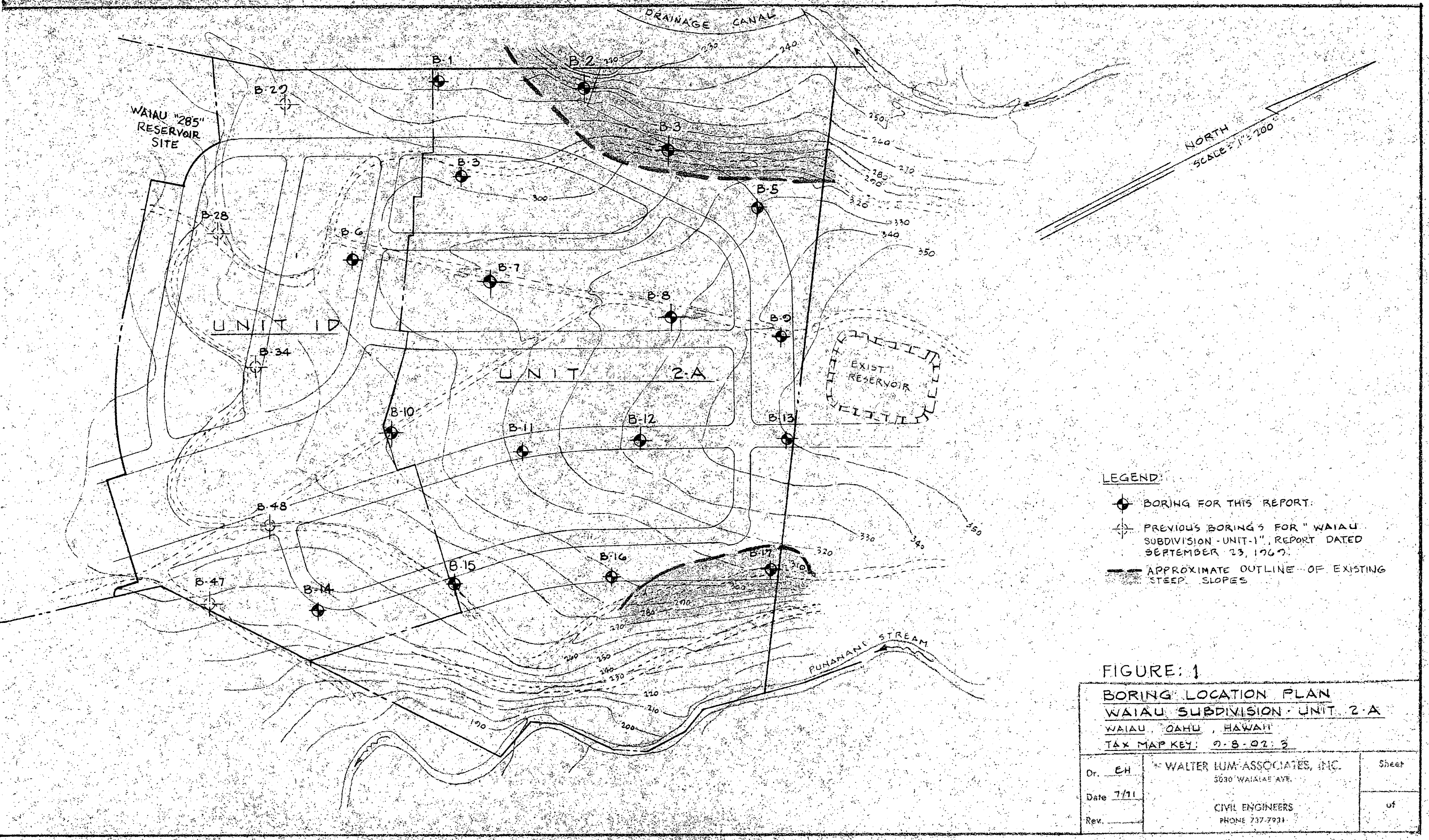
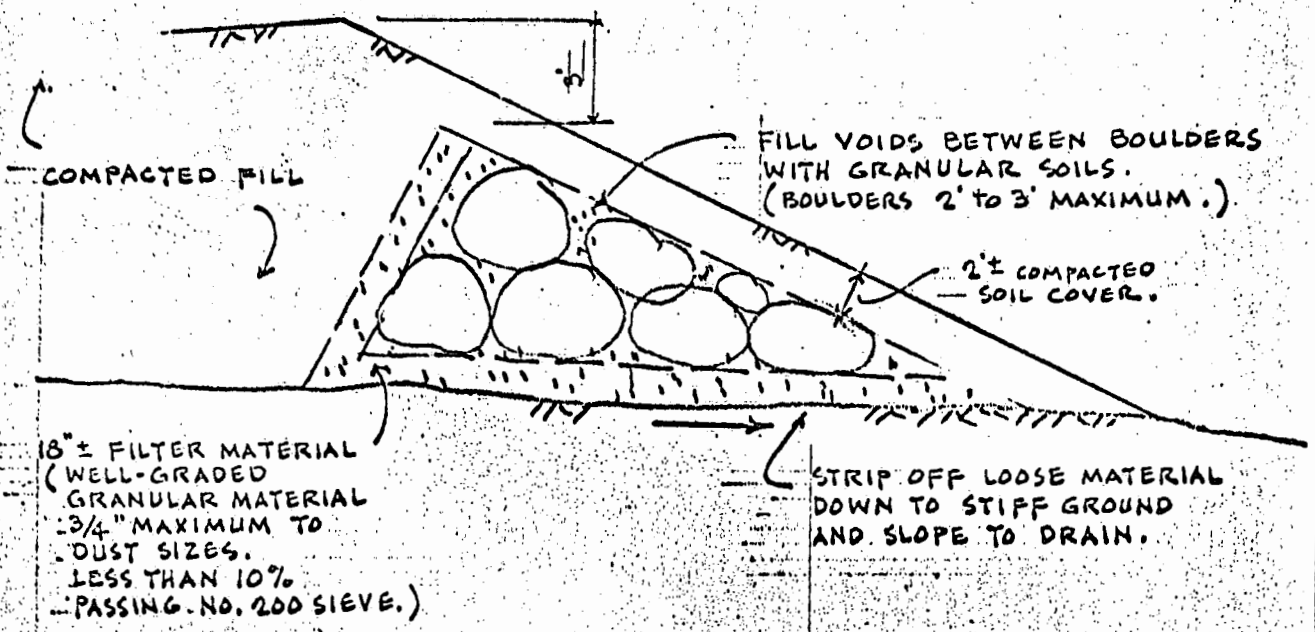


FIGURE: 1

BORING LOCATION PLAN
WAIAU SUBDIVISION - UNIT 2-A
WAIAU, OAHU, HAWAII
TAX MAP KEY: 9-8-02: 3

Dr. EH	WALTER LUM ASSOCIATES, INC.	Sheet
Date 7/71	3030 WAIALAE AVE.	
Rev.	CIVIL ENGINEERS	of
	PHONE 737-7931	



SECTION

NOT TO SCALE

FIGURE 2

PROPOSED BOULDER FILL

WAIAU SUBDIVISION - UNIT 2-A

WAIAU, OAHU, HAWAII

TAX MAP KEY: 9-8-02:3

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

AUGUST, 1971

DRAINAGE CANAL

WAIAU "285" RESERVOIR SITE

B-1 B-2 B-3 B-5 B-9 B-13

B-20 B-28 B-34

B-3 B-6 B-7 B-8

UNIT ID

UNIT 2-A

EXIST. RESERVOIR

B-10 B-11 B-12

B-48 B-47 B-14 B-15 B-16 B-17

PUNANANI STREAM

LEGE

FIGU

BOR
WAI
WAIA
TAX

Dr. EH

Date 7/91

Rev.